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SAFETY RESEARCH

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P R O C E E D I N G S
RESEARCH NEEDS FOR PUBLIC HEALTH AND CONSUMERS
SESSION V

DR. GUZEWICH: Good morning. My name is Jack Guzewich. I work for the Food and Drug Administration, Center for Food Safety and Applied Nutrition, in D.C., where I have been working on the Food Safety Initiative, and more recently, now, full time on outbreak coordination. I'll be the moderator for the first session this morning.

This morning's session deals with research needs for public health and consumers.

Our first speaker this morning is Caroline Smith DeWaal with the Center for Science in the Public Interest, on consumer research needs.

Caroline.

Consumer Research Needs

MS. DeWAAL: Good morning. I knew I was out of luck when they called to invite me to address this conference and told me it was not only on Friday the 13th but at 8:00 in the morning. So if you have to wake me up in the middle of the presentation, forgive me. I'm not from the true farm community. That is clear.

First of all I want to tell you who CSPI is, because I note there are many people in this audience who I haven't met yet. Center for Science in the Public Interest is the largest consumer organization which deals, almost exclusively, with food, nutrition, and alcohol issues.

We now represent about a million consumers, both in the U.S. and Canada. I was here all day yesterday, so I want to spend a few minutes kind of going over some observations from the conference yesterday, and then I'll move on to a list of our research priorities, which look a lot like a number of lists you've already seen.

So I'll try to highlight the things that are somewhat different.

There is a real concern in the public that the current research agenda is weighted more toward animal health or food security issues than to human health and food safety issues, and that is the impression, in a sense, that you folks need to correct.

If the work you're doing is in fact public health research, you need to communicate that. I don't settle for the Aggie label. I've got to tell you, I'm from Vermont, I went to a land grant university and so I can say that, hopefully without getting rotten tomatoes thrown at me.

But the reality is when you look at the biomedical research community, they have done a phenomenal job in selling the importance of their research to the public, and of course, then, to Congress and the President. They got huge increases, last year, in Congress, and they've done an excellent job, and you folks, if you are doing food safety research, which is truly public health research, you need to sell it that way.

I also wanted to make a note that the outbreak data, when we talk--this goes, in fact, to a number of observations I have on risk assessment, but one thing you need to be aware of is that the outbreak data that we are currently using, which is really, other than Food Net, it's the best data available on the risks from food, is really skewed.

So there are pathogens that are not adequately covered. *Campylobacter* is one of them because it generally occurs in individual cases. *Vibrio vulnificus* is another, and there may be others that we just simply don't know about.

So that's something else you should be aware of, and moving on to risk assessment for a minute, you also need to be aware that as much as risk assessment is talked about in this room, and it's in all the federal programs, the outside-the-Beltway perspective of consumers is that, you know, "Gosh, what's this? Naval gazing inside the Beltway? You know, what are you doing in there? Why don't you do something that helps me?"

Risk assessment is something, again, where if it's as important as everyone seems to think it is, you need to communicate that, and it needs to be communicated in real terms, not in, you know, we've got to study every solution before we can do anything for consumers.

Again, risk assessment's going to be weak, if it's based solely on outbreak data. That data is skewed. It's also going to be weak if it's based solely on the most minimal consequences of food-borne illness, which are your classical gastrointestinal illnesses.

There are many very severe chronic effects that can occur from food poisoning. HUS, hemolytic uremic syndrome, is only the most severe example. There are a number of very well-known pathogens that cause miscarriage. Guillain-Barre Syndrome, which is from *Campylobacter*. So again, risk assessment needs to look at the whole range of risk.

And then, finally, risk assessment in the microbial area cannot really be driven to finding a tolerance. I mean, for a few pathogens there might be one, but for many pathogens, the tolerance really depends on the consumer.

If you're dealing with a child, the tolerance is going to be very different than if you're dealing with a healthy adult.

If you're dealing with an elderly person in a nursing home, again, there's no such thing as a tolerance for salmonella enteritidis in eggs. Almost any amount could have potentially fatal consequences.

So I think the risk assessments which I've seen, which I think are the best, are the ones that consider the options for regulatory action, and consider a broad basis of regulatory options, and they try to quantify what the public health effects of those are, rather than the ones that are kind of looking for a tolerance.

I want to just inform the conference of two things I think would be helpful. One is the CAST recommendations on consumer education, a panel directed by Tanya Roberts, and, actually, another researcher from North Carolina whose name escapes me for the moment and a number of people who were here yesterday. Probably many people here today were on that panel.

But they have some interesting suggestions on consumer education and are beginning to grapple with the issue of what's the end point of HACCP. If we know that HACCP for raw foods is going to result in some pathogens remaining on meat products, well, then, gosh, we need to inform consumers of that, and in fact we do have a safe food handling label on meat products today, which addresses that end point of HACCP.

But there are other foods that this pertains to as well and I'll get to that later. Also the EPA standards for the use of human sewage in agriculture. Again that is important, an important information and an important understanding of how the regulatory systems have already addressed the problems of sewage in agriculture, and maybe as people look at the manure questions, we need to be looking at that kind of regulatory context.

Finally, I want to make two notes. One is on the safety of organic foods. I get huge numbers of questions on, you know, what are the microbial risks of organic foods. I can tell you from the outbreak data that we have compiled, we see no evidence that organic food is any more hazardous or less hazardous than traditionally processed food with respect to microbial pathogens.

Clearly, people who buy organic think they're getting food which has fewer chemicals, but we're talking now about the microbial risks, and there is simply no evidence, one way or another.

It would be helpful to know that. If the organic community knows how to handle manure safely--and I've talked to some of them who grow mushrooms in it, who believe they do--then let's learn from them what the techniques are and apply them in traditional agriculture.

Again, the consumer community that I represent is not advocating that you never use manure in farming. I mean, probably one of the best uses of manure may be to plow it back into the land. It is an important resource. It is also something that probably should happen to manure. I mean, manure just shouldn't be left to stockpile. That would be dangerous.

So appropriate use of manure in agriculture. The question is how to use it on food crops, and secondly, the safety of imported foods is also a huge issue for regulators, and case control studies or outbreak studies on imported food would also be very informative.

This is just data we have, that I've been using on the Hill on the outbreak, the import transfer, FDA-regulated product, and as you can see, the number of people regulating foods is that very low line and the number of import shipments is the one that's skyrocketing. Okay. Go on to the next one.

I'm going to go on to our research priorities, and unlike some of the presenters yesterday, I break it down by commodity or food. I love the fact that the Government decided we should regulate hazards in food by pathogen.

Well, we kind of want to know what the foods are. It's more important to know what the foods are than to educate every consumer on the pathogen.

As you'll see, there's a lot of repetition between stuff you've heard yesterday. I'll highlight, though, on these charts, what's different.

One is in terms of the handling of live birds, we think the issue of forced molting, to the extent that it would result in more stress and a possible increase in salmonella, for layers, would be a very interesting question. So any information on that kind of treatment as well as crowding, transportation and diet would be important to us.

Also, what are the long-term consequences of using chlorine on poultry to minimize cross-contamination? And, also, are there alternatives to chlorine? I know you had a presentation at

the end of the day on chemical treatment, and again, I think what consumers are looking for-- we're dealing with a real issue of consumers want fresh, natural food.

They also want it safe. Safety is not a tradeoff. There is nothing that--I mean, nobody wants to purchase unsafe food. But we also want foods which are minimally processed, and chlorine, there are issues around the residues and possibly byproducts which clearly should be researched and alternatives should be identified, and that goes for any chemical treatment that raises the same kind of byproducts or leaves residues.

Alternative chilling techniques for poultry that don't require water. I mean, we have a perfect example in the poultry industry of how to cross-contaminate. If you bring in poultry that's contaminated into a processing plant, you not only allow that poultry to continue on in that state, but you may dilute the contamination but then you spread it to many other birds that are going through that same system.

Quick chilling techniques to cool eggs without cracking the shell. *Salmonella enteritidis* in eggs may be there in low numbers but the hotter the egg is and the longer it sits, the more likely it will be to break into the yolk.

So we need to find better chilling techniques for eggs, and also, some of the impacts of flock eradication versus egg diversion to eliminate salmonella enteritidis in shell eggs. I've done a lot of work in the issue of shell eggs and it's simply inexcusable that the Government has done almost nothing to address SE in the 13 or 14 years since CDC identified it as a problem.

It's an example of how Government doesn't work, or hasn't worked in this area.

Go on to meat issues. We've heard a lot about antibiotic resistance. I'm not going to go over that again, the impact on the live animal on farm research, et cetera.

But we do need more research into vaccines for animals. *Toxoplasma gondii* is a well-known one. Also, we need to get those kinds of products off. Let's move forward. I'm going to skip over manure because it's been well-covered, and produce.

I want to go on to kind of the universal issues which should be three down.

We need better and quicker methods for identifying viral and parasitic contamination. We had a presentation yesterday from Michael Doyle on microbial techniques, but when you look at Hepatitis A, and identifying it off of strawberries, or cyclospora, we have wonderful examples of how we simply do not have the testing technology. So that needs to be improved. Sorry for misspelling the word optimal. But we also need to look at temperatures for transportation.

And finally, traceback is very, very important, and on to the last one on education issues. We need to study the effectiveness of communication techniques, and particularly where the Government is responsible for a lot of communication, they are not doing a very good job. I raised a question yesterday on the gaps in the GMPs, and the language in there, if you've got farmers, that, you know, can get their hands around it, well, that's great, but I'd be real concerned about a Guatemalan farmer taking that same program, translating it into Spanish, and knowing what they're trying to communicate in terms of what, exactly, the farmer should do.

The same goes for communicating with consumers. They just issued a press release,

recently, saying that high risk consumers shouldn't consume sprouts. But it was buried. The public health message in the press release was something buried so deep, that I called one reporter and she said she'd thrown it away because she didn't know what the news was.

Well, if this is the way they're communicating consumer messages, they need to do a much better job. And just put the last overhead on.

We have recommended the use of warning labels for high hazard foods in a number of instances, and this is the model that we've kind of proposed a number of times to FDA, and I'm putting it up. None of those are in place nor to I expect them to be, but the concept of using a logo or some signal to consumers that could appear on the front of food products that say, "These are higher-risk products, they shouldn't be consumed by children or elderly," or they need to be handled with special care.

Again, if consumers are the end point of the HACCP system and if we're relying on them to take steps to assure the food is safe when it's finally served, we need to communicate that message to them.

Thank you very much.

DR. GUZEWICH: Thank you, Caroline. There will be a panel discussion at the end, so I believe at that point you'll be able to ask questions of our various speakers.

The next scheduled speaker was William Brown with ABC Research in Florida. Mr. Brown was not able to be here today because of pressing food safety issues.

Instead, he's being represented by Dr. John Carpenter, professor emeritus, University of Georgia on transportation and handling issues. Thank you.

Transport and Handling

DR. CARPENTER: Good morning, ladies and gentlemen. I'm pleased to be here on behalf of Bill Brown. It calls for a little explanation, I guess. I'd like to say that, boy, the crowd's really thin this morning. I don't know how they got the word so quickly, but unlike our previous speaker, Caroline, I am a farm boy. I like to tell people that I'm a farm boy from South Dakota. I started out with nothing and I've still got most of it left after 40 years.

I'll explain, briefly, why I'm here instead of Bill Brown, although the moderator did a very good job of that.

Let me explain my background a little bit. I worked in academia for 40 years and I retired a year ago in August, after 35 years at the University of Georgia, and my main area, commodity area, was meat and poultry, and the discipline would be food microbiology.

Coincidental to that, about 30 years ago, I was approached by one of the major transporters of perishable food out of Atlanta, Georgia, if I would do some product evaluation work for them from time to time as they had need, as they were offering product for delivery and it was refused.

So I started doing that with them, and they passed my name around to some other companies. So for 30 years I've consulted and assisted the industry in evaluation of perishable foods during transportation. So I do have a good bit of experience in the area of transportation.

Now my relationship with Bill Brown goes back about the same time and about three weeks ago Bill called me. He always calls me about 8:00 or a quarter of 8:00 when I'm having my second cup of coffee. That's what retired people do, you know.

But he's up and at it already, and he said I have to give this talk in Washington and I wanted to talk with you a little bit about what might be some issues in transportation that some research would be needed.

So we discussed it a little bit, and then, last Monday, I got a little more frantic call about quarter of 8:00 in the morning, when he said I'm covered up with some work here and would you go and present what I have prepared. And I agreed to do it, and so I'm here. He said I have already prepared it. So I have his text and his overheads, and he also told me to be free to say anything else that I wanted to, and he said that because he knew I would anyway. So if there's something that you like about the presentation--those are my ideas--and if there's something you don't like, that's what Bill wrote. Okay?

Now, let me say just a word about transportation of food, transportation of perishable products.

This is a very interesting area because it's one that's not that well understood by scientists, not too well understood by consumers. Sometimes, I don't think it's very well understood by the people who are working in it.

But you have to understand some of the problems that they run into before you can talk about what kind of help do they need or what kind of research would aid them.

First of all, much of the transportation within the United States is done by refrigerated trailer, and I will say this, that many companies have their own good transportation practices, if you want to call it that, although they've never been labeled that, of how they handle their own product, and if it is a perishable food and they own their own trucking line, their own employees have it, they load it on a trailer and they haul it from the point of origin to the point where it is delivered and it's all under their own control, this is the simplest of transportation methods.

But we go from there to a company who puts a load on a leased trailer, or a trailer that they don't own, or maybe they own the trailer but there are owner-operators that own the truck, and so the owner-operator is responsible, then, to deliver the product to the other end.

This complicates it because the control of the product leaves the manufacturer and passes over to the person doing the hauling. Now, in addition to that, the simplest type of loads are those that are loaded on a trailer at one place and delivered at another place.

But in between that, there are many variations of that. There are less than truckload lots, known in the industry as LTL freight, and this stuff gets hauled, if you send LTL out of Chicago to Jacksonville, Florida, it probably goes to Atlanta, Georgia, where it's off-loaded, and then it's reloaded on another manifest on another trailer, and so it goes from the manufacturer to the

hauler, back to a warehouse, from the warehouse back on board another tractor-trailer, refrigerated trailer, and then it is finally sent to another warehouse.

So it gets more complicated as far as control is concerned, and guidelines for control.

Now, also, in addition to LTL, there are practices known as drop shipments where a trailer is loaded and it is sent out from a warehouse and it will make anywhere from 10 to 15 stops to unload small quantities of perishable food, and every time they unload it of course they have to open the doors, they have to close the doors, and so forth.

So transportation is not really that simple. In fact it's much more complicated than that. Product coming in from overseas, of course most of it comes in Sealand containers, and it arrives here at port. Sometimes they're hauled into a warehouse, they have to go someplace, they're hauled into a warehouse. Seldom do they go directly to a manufacturing plant, although they may, and so it's handled several times as well.

Now, in view of all this, a group of us were asked to prepare a report on transportation of perishable foods and that's this report here, and it was completed in 1966.

These are the people that were involved. Bill Brown was the chairman of it, I was the chief editor and scribe, and the other people provided much of the information, and these are people from industry and some from academia. But it was to do an evaluation of what's being done in the transportation of perishable foods, but only in meat, poultry, fish and dairy. It did not include other foods, beyond that.

If you would like to have a copy of this, there are copies out on the desk. If they run out of copies, you are to contact Dr. Bill Brown, whose name and address is in the program that you have, and he will send you one. If you'd like to have a copy of this.

But we met and we found that there's an awful lot of information out there in the industry. Many people are doing some form of good manufacturing practices. Some people are moving towards a HACCP plan. Some people, who are transporting or shipping perishable foods, are very well-organized, and we need to know what these people are doing.

The transportation industry handles, total, about 450 million tons of perishable food, annually. From this, about 10 percent of it is exported, and that that's exported, about 5 percent goes by air, 35 percent by land, and 60 percent by sea.

So most of the export goes on the Sealand containers. If I could go to the second overhead, please.

This overhead I believe shows some of the food transportation cycle from the plant to the airport, rail truck, airports, and so forth, and finally gets to the retail store. Now, one of the compilations in transportation is that there are legal documents that accompany these shipments called bills of lading, and the responsibility for the product moves with the product, not the ownership but the responsibility for it.

So if guidelines are to be developed, if there are to be good transportation practices, these have to be instituted across a number of elements of the transportation cycle, that are not necessarily related.

In other words, one doesn't have control over the other, so it has to be a coordinated effort based on everybody who's involved in the transportation cycle.

Now we were approaching this study that we did in the transportation of perishable foods from the HACCP standpoint, because many of these companies, most of these companies do have some sort of HACCP plan, and I think the next overhead, Overhead No. 3, simply outlines HACCP principles of which most of you are familiar.

So I'm not going to bother to go through those principles. But most of the meat and poultry plants, and the dairy plants that we dealt with, and all of the fish plants, by the way, have approved HACCP plans to control such things as temperatures, which are so critical during transportation.

Maintaining the temperature is a very big problem during transportation. As I mentioned earlier, we have such things as loading and unloading, and refrigerated docks, and unrefrigerated docks. So maintaining temperature is very, very critical.

Now the thing that a lot of people do not realize is that refrigerated trailers are designed to maintain temperature. They are not designed to raise the temperature and they're not designed to lower the temperature, and most shippers have pretty well gotten away from the idea that they'll load product on a little warm and that it will chill enroute. Just doesn't happen. That just doesn't happen.

By the same token, a well-refrigerated or temperature correct load that goes on a trailer represents quite a cold sink, so that it takes quite a bit of temperature change before the temperature actually will rise in that shipment.

Some small operators, particularly owner-operators have relied on this and as they start down the road, since they're buying the fuel for the refrigeration unit, they will cut the refrigeration unit off, relying on the cold of the product within the trailer to keep it cold for a while, and they get within so many miles of their destination, they will turn it back on again like it had been running all the time.

This is a very small portion of people that do this, but it does occur. So there is a great need for education and training of people who actually do the hauling, and this, as I said earlier, would be easy if they were your employees. If they're not the shipper's employees, it becomes very difficult.

So that means that we must first identify--let's see--I think we had another overhead there, did we not? Yes. This is a transportation HACCP plan, a model plan for meat and poultry products going from live on through, all the way through to the warehouse, and I'll just leave that up there so you can look at it.

I wanted to mention that the engineering side of refrigerated transportation has done some wonderful things as far as tracking their equipment. They're now using satellites to track their equipment, both the railroad cars and refrigerated trailers as they go up and down the road.

Now they can also, with a little more sophistication, they can also monitor the temperatures that are on those units as they go down the road. They can tell where they stop,

how long they stop, what the temperatures are, if the temperatures get above normal, or above that which they're supposed to haul it at.

There are those innovations that can be used, and of course only the larger companies use them; but there are an awful lot of independents out there that do not come under these things, are not monitored as they go down the road.

So that means as with any HACCP program, the person that's going to make your HACCP person is the person on the spot, on the ground. In this case it would be the driver. Just as your HACCP plans in plants depend upon the--I don't like to use this term, the lowest worker--but the worker doing the most menial tasks in your plant to make your HACCP plan successful. To make a HACCP plan for transportation successful, it requires education and training, and supervision of drivers, and I don't know how we do this across those areas where we don't have control of those people.

Now, as far as research needs, I think that the most pressing research need for other perishable foods would be a study very similar to what we did in meat, poultry, fish and dairy, which would identify what is out there already.

We cannot proceed to do research if we don't know where we're at now. We have to know the location from which we start before we can begin a journey. So we need to have--I know information's out there, we need to go to the industry, there are people that are doing things that we need to know about, but it needs to be discovered, it needs to be coordinated and put together into some sort of cohesive report, so that we know how we can best approach developing good transportation strategies for the rest of the perishable industry, and, with that, I will stop.

Thank you for your attention, and the books are out on the table.

DR. GUZEWICH: Thank you, Dr. Carpenter.

I have not had a chance to meet our next speaker, David Schmidt. David Schmidt is going to be speaking on retail issues and needs. He is employed by the International Food Information Council.

Retail Issues and Needs

Dr. SCHMIDT: Thank you. Good morning, everyone. I do have some slides. I did want to clarify, first of all, for my friends at Food Marketing Institute, that I'm not really addressing retail issues--they're probably the group to do that--but I think my talk is more appropriately titled "Consumer Issues and Priorities Related to Food Safety." I will be using a number of the research findings that the Food Marketing Institute has reported from their trends research to make the point, but I just did want to clarify that we certainly don't represent the retailers.

So just this morning I wanted to give you a quick introduction to IFIC and the IFIC foundation, some of you are probably not aware of what we do, and then I wanted to cover some

of the consumer research that's been done on attitudes towards food safety and food irradiation, because I think there's a lot of good data out there to really let you measure where consumer priorities are right now, and then finish with some recommendations and priorities that will be focused on the consumer education area.

I know you've heard a lot about the scientific side of the research, and I agree with the point that Caroline made. There's a tremendous need to focus more priorities on the consumer education area.

So the International Food Information Council's mission is to communicate sound, science-based information on food safety and nutrition to a number of influential audiences, including journalists, health professionals, Government officials, educators, and consumers, and we are supported primarily by the food, beverage, and agricultural industries, and we do not play any role, however, in lobbying or regulatory policy.

We do have a comprehensive Web site that I'd encourage you to visit. You see our Web address here. It'll also be in some slide handouts and I'll also have a packet available outside, that looks like this, that'll have all of my slides in the information inside.

Hopefully some of you are familiar with our newsletter, Food Insight, that comes out every two months. It's now sent to about 45,000 opinion leaders, about 5,000 of which are the news media, and we do cover current topics on food safety and nutrition. If any of you would like to get on the free subscription list, just provide me your business card after the presentation. I'll be happy to add you to that.

I think it's interesting, as we look at research policy, and I know you're spending lots of time on this, that there is an interesting changing paradigm where, at one time, research policy was driven by focus on disease, and consumers got their information about this from doctors. We've really moved on to a totally different paradigm where research policy is really more focusing on wellness, and consumers and physicians are getting most of their information about food safety and nutrition from the news media.

It's very common for a doctor to first hear about a particular advance in a food safety or nutrition issue from a patient coming in to tell him something they just heard on the news last night as opposed to the doctor reading the journal and informing themselves. Generally, they don't have time to read those journals unless the media has called attention to them.

So it is a very different dynamic situation that we're in. Just to give you another example of the work we've done. This is an IFIC review that'll also be in your packet: "How To Understand and Interpret Food and Health-Related Scientific Studies," and this is something we've also provided to journalists to avoid the idea of focusing on one scientific study to either set policy or change consumer behavior, but really looking at how an individual study fits into the total context of science that's occurred to date.

Now in terms of current consumer interest in food safety, no surprise to you that the current concerns are primarily focused on microbial food-borne illness right now, fueled by media coverage of all the outbreaks, but do seem to be occurring on a regular basis these days.

We do find consumers, through our own focus group work, and attitudinal surveys and studies of others that I'll be going through, that consumers are becoming more realistic in realizing that there's no such thing as zero risk in today's society. They aren't looking for a magic cure to all of our problems but they are looking for some solutions.

We also find they want more information from credible sources. The thing about this whole food safety area that we're addressing, we do have the public's attention, now, and I know when I was at USDA a few years ago, that wasn't necessarily the case. So this is certainly a critical issue for education, that when you have the public's attention, you need to take advantage of it.

I think to go back--I'm sure many of you in this room would know of Virgil Wodika, who's a former head of CFSAN at FDA, and he had put together what he called the actual food risk hierarchy, at that time, and you notice the first two items up there, in bold, because they were really the ones at the top of the list, and that was microbial pathogens, and then, number two, nutrition, and that could have been an issue of excess, or deficiency. At the time, I think it was looked at as more of a deficiency issue. But things such as environmental chemicals, toxins, pesticides, food additives, further down the list in terms of priorities.

However, I think the reason he did that hierarchy at the time--it was out of frustration, that perhaps the Government resources weren't really directed properly towards the right resources. In the '70s and '80s, we were focusing an awful lot of Government resources on the perceived chemical risks, and the microbial issue really didn't get a lot of attention, the way it is now, and of course in the 1990's, I think that situation has changed, and that it's changed for good reasons.

As I mentioned, the increased awareness of food safety has certainly been driven by the news media. The Partnership For Food Safety Education, that is the Government/private sector partnership, has created a lot of awareness about the needs for safe food handling through the Fight BAC campaign, and other areas, and that is all very positive.

I'll start to take a look at some of the survey work. There's a group, CMF&Z, has done a food safety survey over the past few years and has come up with some interesting trends, and theirs is unique in that they interview consumers and reporters for their attitudes about food safety.

So, first, they asked a question: Why is food safety more important than one year ago? And 69 percent of consumers said it was the media attention and public awareness, and journalists and editors focused more on the food safety problems themselves.

Also I think this is interesting. You asked each of the two groups, consumers and journalists, to rank public safety issues. Consumers put food safety at the top of the list, followed by drinking water safety, crime prevention, nutrition and environment, whereas journalists, despite all the attention, they've placed it fourth on the list, with nutrition as being number one.

Now this slide I think gets closer in actually measuring where consumer priorities are now. This work was supported by the Food Marketing Institute, conducted by Tom Hoban of North

Carolina State University, who's done some very interesting trend work in this whole area, and here you look-- very clearly, microbial contamination is at the top of the list, and I do want to point out--this slide is a prompted slide in that they gave consumers the option of all these. Pesticide residue is further down the list. Antibiotics and hormones are up there. Irradiated foods, dropping back. Additives and preservatives, and biotechnology, near the bottom of the list in concerns.

But what is interesting--the question was also asked in an open-ended basis where we did not prompt all the options you could choose, and look at the difference here. Again, microbial contamination comes out at the top at 69 percent, but concerns about pesticides fall way back down. Additives, preservatives, biotech, irradiation, really don't come up, unless you prompt them.

But I think this certainly reinforces the public's attention on microbial foodborne illness, and I know you're spending a lot of time on it, and I think this certainly proves that that is justified.

Now also from the FMI trends work of 1998, that was released earlier this year--and I want to apologize for the readability of a couple of these new slides that we produced here. The print is not large enough, on the bottom. I'll read that for you.

But perspectives about contracting food-borne illness from food prepared at home, and on the bottom you see the percent who believe it is very or fairly common, and number one on the list, on the left-hand side there, are parents with young children, and I think they are certainly the ones who've heard the messages about the issues with the ground beef, and others, that have occurred, and media coverage of that issue I think has raised a lot of awareness.

Then following on down the list: African Americans, Hispanics, part-time female workers, under age 39, and Southerners, are the most likely to believe it's fairly common to contract illness at home.

Also, in terms of the importance of food safety now, really from a marketing standpoint, also the FMI trends work shows some very interesting data here, where food safety was much less of a concern, even earlier, in the '90s, but it's now, again, on the upswing, again, I think based on all the coverage and the outbreaks. So we do have the public's attention there.

And also this one. I think it really reinforces the need for education and this is consumers' response to the question of who has the primary responsibility of insuring safety of supermarket food products, and again, reading across the bottom, the first one on the left is yourself. So that's the consumers saying that they are responsible first, followed by manufacturers, food stores, Government, consumer groups, everyone, farmers, and then "Not sure" is at the bottom of the legend there. Also from the FMI trends work, the number of consumers who are confident, or mostly confident in the safety of the food supply, and you see while that was on the upswing through 1996, again, there are more concerns and the confidence in the food supply does seem to be declining somewhat since 1996.

I'm also going to quickly run through another topic that I think deserves a lot of attention

from where consumers are looking and anticipating food irradiation in the near future.

We had conducted some focus groups, early this year, prior to a conference sponsored by Public Voice on food irradiation and consumer attitudes.

We did several groups, and these were done somewhat nationally, Los Angeles, New York and Dallas, although because this is focus group work, we certainly don't apply statistical significance to this. We had a very diverse group of people participating in the groups, and we also insured that at least half of those there were parents with children. We knew that was an important part of this whole area. Among the major highlights here, that there was a lot of concern. While there was confidence in the food supply, there was concern about some of the higher profile safety issues that had been discussed in the news, recently.

But we did learn that consumers will accept irradiated food in conjunction with other quality and safety measures. I think they are very smart and they don't see this as a panacea, "magic bullet," but as long as other measures are taken, I think they're willing to look at it.

We did find that awareness and understanding about food irradiation was much higher than we expected, in that we found that education improves acceptance of food irradiation, even among those folks in the room who were initially skeptical about the process.

One thing for you to note is that the awareness and status of governmental approval and endorsement of food irradiated by other health groups such as American Medical Association was very low. We found a number of consumers in the groups hadn't heard anything about it, and said that if they knew that that was really the case, it would certainly enhance their likelihood of endorsing irradiation. So it goes back to, again, communications and are we really using the best methods to get the messages out.

We did find a key question for us was were consumers willing to provide irradiated foods to their families, including children, and in many cases those were the ones most motivated to try these new products. There was such concern about the chance of microbial illness, that they were among the most enthusiastic.

And we also asked the question: Did they see irradiated foods--other than just home use, they certainly felt that fast-food establishments and restaurants certainly could benefit from using irradiation in the future.

They do see irradiation as an added benefit to quality in processing, as sort of the whole idea of an insurance policy. We found also that they're much more interested in food safety than they are shelf life. We certainly learned through these groups that the term "shelf life" actually was a turnoff to some consumers. The whole idea that they don't want something that's been sitting around the shelf for 5 years, or whatever it is.

But they really could identify with a benefit from reducing that microbial count on it. We did also find that irradiated meat and poultry was much more desired than fresh fruit or vegetables, and, again, it was the idea they expect their fruits and vegetables to be fresh, and anything you do to change that is much less desirable.

We also looked at some of the terminology that's been used. We found that cold

pasteurization was the best alternative term to food irradiation, and we found, also, that if you put, say, cold pasteurization with irradiation, in parentheses, that was perhaps the best transition to changing the term. Many consumers felt "irradiation" is not a real attractive term, but they didn't want to be fooled, and they thought if you were up front, and essentially doing it this way, that here's a name change, that in the future, you could drop "irradiation" from it in the next 3 or 4 years.

So we certainly found through these groups that consumer education is key on irradiation, just as it is on general food safety, and also to show you consistency with other works, go back to the CMF&Z food safety survey, see consumer awareness on irradiation way up in 1998 compared to '96 and '97. It's doubled, and we do think that the public is much more attuned and the time may be right for this.

FMI trends on food irradiation. Most likely to buy irradiated products? 62 percent would be families with children under six. 63 percent, families with five or more members.

So, again, a lot of data showing there's confidence in the benefits here.

Another one from the FMI trends survey. Eight in ten consumers state that they would be very or somewhat likely to buy a product labeled "irradiated" to kill harmful bacteria.

Also the FMI trends, in terms of how consumers want to be educated, they now say the primary sources are newspapers, Government publications, and supermarket brochures, but the ones they'd really trust would be medical organizations, health professionals, and university experts.

So those are the folks we need to look to keep in the communications loop. So in terms of irradiated, as consumers conduct their own risk assessments, they are quite willing to try irradiated foods now, and so the time is ideal to meet consumers' expectations about food irradiation through educational campaigns, and I think it's interesting that the current Fight BAC campaign does not include any mention of irradiation as one of the tools, and I think it'd be important to add that to all of the general food safety education as products become available.

Now we also need to look at other awareness efforts, taking a look in consumer education, not only what new things we can do, but other communication vehicles where consumers are already getting lots of information.

So one of the ways we have recommended is incorporating food safety into the current nutrition education vehicles that the public is being exposed to. The Government has spent lots of money in the whole nutrition education arena, and, in many cases, there's no mention of food safety at all, and we think this would be a very easy way to get to some key audiences when you look at the at-risk audiences, that would include the WIC population and others, it would be very easy to incorporate food safety messages, safe food handling messages into those.

And also as Dietary Guidelines 2000 are now being considered, we're very pleased that the Dietary Guidelines Committee has said they will study ways to weave food safety into the dietary guidelines, and I think this will be a critical piece, too, that the Government becomes consistent in their food safety and nutrition communications.

I think something that Caroline touched on as well, that I'd certainly like to reinforce and give some more thought to. Taking a look at, as you're doing at this conference, the proper ratio of science-based versus consumer behavioral research.

We know there's a lot of money spent, and very properly, on identifying scientific solutions to this whole area, but I don't think there's enough being spent on the whole consumer education arena.

We know from CDC that as much as 80 percent of foodborne illness may be prevented by safe food handling techniques, and yet I don't think we're spending the proper resources to get the messages out to consumers, that would really go a long way to prevent that.

So exactly the point Caroline made. We do need to investigate how best to reach the consumer in today's technology environment. There is such a competition for share of mind in terms of consumer resources, what they're reading, what they get on the Internet. The network news is further diminished in terms of where people get information, so it's much more difficult, and I think the Government can play a role in really helping to identify ways to get their attention and get these safe food handling messages across.

So I think it's certainly possible that food safety may be enhanced, even more through consumer education, than more research studies from a scientific standpoint, and yet, by no means are we saying to eliminate scientific research, it's critical, but just try to make a little more room for consumer education.

So finally, I think the point is the teachable moment on food safety is here now. We do have the public's attention. We do need to take advantage of that, and we need some out-of-the-box thinking to get to the proper education channels, put much more work in. I think just the routine consumer education techniques aren't going to work, and a combined focus on food safety and nutrition will far exceed separate approaches, which I think we see in the Government and in the private sector right now.

So more integrated approaches, whether it's the classroom, or a number of other places, would make a lot of sense.

So, with that, I appreciate you having me here this morning, and, again, the package should be available outside for you.

DR. GUZEWICH: Thank you, David.

Our fourth speaker this morning is Dr. Alan Levy who works for the U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, where he works in the consumer research area.

Consumer Behavior

DR. LEVY: Thank you, Jack.

It's nice to be here today before an audience that I don't normally get to talk to. One of

the differences in my talk today is on what are the priorities in consumer research relating to food safety, and one of the important differences between consumer research and the kind of research we've been talking about over the last couple days is that consumer research is primarily oriented towards information policies, basically regulatory strategies, often could be separated in the control strategies, which are what mostly we've been talking about over the past few days.

But there are also information strategies. Information strategies are things like consumer education, labeling activities of various kinds, disclosure, consumer right to know. These are all information policies, and consumer research is primarily oriented toward that. Can I have the first slide.

The kinds of things you're likely to use consumer research for is you want to evaluate program impacts, and one of the things that's increasingly true--and David alluded to it before--is actually any kind of Government program intervention is going to have to have an information component to it, even if it's mainly an information strategy, has to be communicated to consumers in some fashion.

In fact it's important to appreciate that one of the primary purposes of food safety programs is to preserve consumer confidence in the safety of the food supply. That is a necessary program impact, even if you're doing entirely control type strategies.

So you want to be able to evaluate program impacts, if nothing else, just to understand what kinds of impacts it's having on consumer confidence.

Increasingly, you want to be able to support the design and implementation of labeling and education issues, which many people are proposing--Dave and Caroline are good examples--need to be emphasized more as an actual intervention strategy. Another potential purpose of consumer research is it provides key parameter estimates for certain variables in your risk assessment models, and, particularly, you want to know who is engaging in risky consumption behavior. Who's eating their eggs undercooked? Who's eating hamburgers, pink? Who's eating raw shell fish? These are not uniformly distributed throughout the population. There are certain groups with certain characteristics who are engaging in these practices. You need to know what the distribution of the consumption behaviors are within the population, and, similarly, with respect to practice. Various kinds of home kitchen practices that people are engaging in. You need to be able to assess who is in fact more or less likely to be following good practice. Who is susceptible to changing those kinds of practices.

And finally, you want to be able to estimate the market and welfare effects of different information policies. I include under information policies things like any kind of labeling, disclosures on labels, safety claims which are increasingly being made in the marketplace, warning labels would be an information policy, and, you know, the USDA has safe handling labels on meat products.

You want to be able to evaluate both the market effects, which are grossly understood as how they affect people's likelihood of purchasing products, but also the welfare effects, and welfare effects are really, can be understood as the long-term educational benefits of these

information policies.

One of the challenges in this kind of research is you want to be able to separate the educational impacts of various kinds of information policy from their immediate market impacts. Can I have the next slide.

Basically, you need all kinds of different research approaches to address these uses, and here are the basic kinds of research methodologies that you need.

Probably the most important, the most generally useful are these representative population tracking surveys. We can identify trends over time, in knowledge, in attitudes and practices, and that's going to be the kinds of things FMI has been doing in their trend survey, and FDA has been doing in its trend surveys on food safety.

You also want to be able to access various kinds of sales databases. You want to be able to identify how the market is changing. Here, you're talking about market share, whether certain kinds of products, increasing or decreasing, and what's the impact of new product introductions.

Another major kind of research methodology that you need is you need to do qualitative research, primarily focus groups, to both test messages and test execution of labeling and consumer education campaigns.

Another piece that really is horribly needed and is basically practically nonexistent is you need observational studies of in-home practices. Everyone I think appreciates the problems of self-reporting with respect to food safety behavior. One of the things that we found in our qualitative research is that people actually are very, very concerned, interested about food safety, and they don't like to admit that they're doing anything wrong.

In self-report kinds of situations, which are what surveys are, you're almost certainly going to get some kind of bias, so that people aren't going to admit they do bad things. That's a challenge to the data. But you also want to be able to calibrate your self-report kinds of data with what people actually do, and one of the most enlightening things I've seen in the last six months is we started to look at some approaches to do in-home observation studies, and we have some wonderful videotapes of people preparing standard recipes in their kitchens, and the variation of people washing their hands.

When we talk about--we asked them, Do you wash your hands? Do you use soap?--they say "Yes" and, you know, within the retail food service industry, hand washing has a certain definition. You know, washing vigorously for 20 seconds. In the home situation, there's a much, much greater range, and sometimes hand washing means wetting the tips of your fingers, and that's it. That's what hand washing is.

You need to understand that variation. Then finally, and perhaps most importantly to really make some progress in this area--you need experimental analysis. You need experimental studies of how different information policies impact both their education effects and their market effects, and basically you need simulated market type situations where you can test, you know, in a fairly quantitative rigorous way the effects of different kinds of information policies.

Let me go through some of the problems and the strengths of these different kinds of

approaches and what they're good for.

Basically, a tracking survey describes the state of the consumer environment and how it's changing. Usually the most useful thing for policy makers is to be able to identify the trends that are going on in the marketplace, and the only way you can do that is you've got to have surveys, same samples, same questions, over time to see how things change.

Very few examples of that. The FMI survey is one example, there's a few others, and FDA and USDA have a joint tracking survey on food safety.

What you can do with this is you can estimate the prevalence and incidence of selected behaviors and practices. This is what you need to do your segmentation, to identify important audiences that may be at risk. You need this as input into your risk assessment models, which have consumer behavior as a parameter.

You need this to evaluate the effects of ongoing programs and impacts, because changes are going to identify those impacts.

Knowledge, attitudes, and reported practices are what you get from population surveys. Another thing that you do is you can actually model, using this kind of data, what kinds of knowledge, what kinds of awareness is related to the best kinds of reported practices. So you can actually look at the interrelationships between the cognitive variables, and reported practice variables, get some idea as to what you need to emphasize in your education and labeling messages.

Now, the research needs in this area, first and foremost you need to validate and standardize your measures of reported practices and risky consumption behavior, risk perception and consumer confidence, across surveys. There's lots of different ways to answer question. The details of how you answer questions can make a huge difference.

You need to validate, you know, exactly how these questions should be asked, and as much as possible, to gain the synergy across surveys. It would be nice if surveys could use well-validated kinds of measures, consistently, across things.

One of the examples of this problem is in the CDC Food Net data. They have a consumer survey which asks about washing cutting boards, and hands, and it's similar to a question that we ask on the FDA food safety survey.

Their question essentially gives people a choice between saying they wash or they don't wash their hands. They get 95 percent reports that people wash their hands. Our question asks whether you wash your hands with soap, whether you just rinse them and wipe them, or whether you do something else.

So we give them another option, which is a little more acceptable, and what we find is that when they're given the option of just rinsing and wiping, only 70 percent of the people say they use soap.

So you've got to be aware of how to ask the question. It makes an enormous difference in the kind of result you get.

Another important need is you've got to, I think, over the next few years, so we have to

calibrate the kinds of reports that we're getting from the surveys, which are primarily telephone surveys, against the observational data, so we have some idea about the extent to which the self-report data is somewhat inflated.

Finally, we need to coordinate the information needs among the public/private sector, because we have a lot of different agendas here, and we need to understand what kind of information is going to serve everyone, and we need some kind of coordination so that the information objectives of the surveys have input from all the interested parties.

The nice thing about market share surveillance studies is they give you direct indicators of the program impacts. It would be really nice to know how many people have bought thermometers in the last few years, and what's happening to the sales of thermometers. USDA has done this fairly extensive program to try to get people to use thermometers more in testing the temperatures of cooked products.

But we don't have, currently, we don't have much information about what's going on in that marketplace. The nice thing about surveillance, market surveillance studies, is they give you revealed instead of self-reported preferences. Economists are much more impressed by revealed preferences than they are about self-reported preferences.

You can easily monitor the results of the market surveillance studies to estimate your program benefits. Again, this is much more helpful, if you're going to provide input into the cost-benefit analysis, which is an important concern now within the regulatory community.

What you need to do with marketplace is you need to identify naturally occurring quasi-experimental opportunities in the marketplace. These are happening all the time. The example of the recent attempt of an educational program to talk about the use of thermometers, that's a quasi-experimental opportunity. If you were tracking thermometer sales, you'd be able to identify the impact of that particular program.

So we need to identify those opportunities, where they exist, and the other serious issue here is it's often very hard to obtain access to this data, which may not exist, which may be proprietary, and often is very expensive, if it does exist.

Qualitative research studies are focus group kinds of things. One of the primary values of this kind of research is it can test the communication effect of this, of specific messages and specific kinds of labeling proposals.

It doesn't give you quantitative assessment of these things. It doesn't tell you whether this word works or that word works.

It tells you whether you're in the right ball park at all. It really tests the validity of the assumptions that policy makers have about what kinds of information are important and useful to consumers, and they also help you to clarify your differences between the different kinds of target audiences that you might have.

FDA has recent and unhappy experiences with crafting messages, crafting warning statements, which, when tested, do not exactly work as intended, and it's really necessary to subject the assumptions that often underlie policy information strategies, information kinds of

information, interventions, are very attractive.

They seem to be easy. They don't seem to require as much science. They often solve political problems. So there's a lot of other agendas which are being furthered when you talk about information strategies, and it's really important to test them against real audiences, to make sure they're having the intended effects, and they in fact work remotely like they're supposed to.

Finally, the last kind of research that I think is really needed in this area is this experimental analysis of information policies. You need to set up situations where you control, and you give people tasks. You essentially create a simulated market kind of context, where people are doing the kinds of things that they would normally do with the information, and you test exactly how well that information works in this simulated market context, and you have to do this in order to separate--and this is just a critically important thing--questions of what people like from what actually works.

People like a lot. There's a tremendous tendency for people to say they like more information, and if you ask them, they'll say, "I always want more information." But when you actually test what they can use and what they can handle, it's often the case that more information is not in fact practically effective. They can't use it, and you want to be able to separate this problem of what works from what they say they like.

The other important discipline that experimental analysis is going to force on you is it's going to make you specify how consumers are actually likely to use the information.

When you talk about information policies, they don't do exactly the same thing as control policies. You know what a control policy is doing. But an information policy has multiple effects.

It helps people make product selections. It helps determine their long-term behavior in the home. It has these educational effects. It has market effects. It has all kinds of effects, and you need to distinguish between these different possible effects and develop measures for each one so you can independently assess them.

The nice thing about experimental testing is you can actually compare policy options before you get into the expensive proposition of actually implementing them in the world, in these artificial simulated market situations you can test different options.

You can look at how warning statements actually work. You can look at how various kinds of educational approaches work, and you can actually quantitatively distinguish the effects on the different kinds of purposes and uses that they're likely to have.

You know, the different kinds of information effects can be differentiated and separately measured in an experimental context and you can distinguish between the purchase decision effects, the comprehension effects, and the long-term education effects.

The research policies here are really quite unique to what the policy process is willing to put forward. The main thing you have to understand--or not understand--but the given in these kind of studies is you have to know what information policies you're studying, you know, are actually in the ball park, or might be proposed.

Right now, we're talking about all kinds of possible information policies in the area of food safety. We're talking about consumer education, warning labels, various kinds of safety claims that are being made, certification kinds of approaches, this whole issue of consumer right to know and what should be disclosed about the specific products. These are the kinds of policies that need to be evaluated, but not all of them are actually likely to happen.

One of the problems when you do these kinds of studies is that you have to include in the range of options that are being tested, ones that are likely to happen, that represent the different ranges of the spectrum, that represent an industry proposal, that represent a consumer proposal, that represent the regulators' proposal.

You want to span the possible options that can occur, because once you do them, it's fixed. You can't go back and say, well, if you change it, then the ability to generalize and relevance of the results are drastically weakened, if you do something that you never tested.

So you need to include the realistic range of options, and the other thing you need to do--and this is probably the most difficult thing in these kinds of studies--you need to develop the measures that capture the different possible purposes of the information, and, in particular, you need to address what are the educational benefits, what are the market effects, both direct effects on consumers and indirect effects on producers, that are likely to innovate and introduce new kinds of products in response to information policies.

You need to address things like, you know, what's misleading. So you need measures of how misleading something might be.

The other thing you need to do here is you need to address this whole issue of special populations. People with special needs, people particularly at risk, whether or not there has to be--they are explicitly taken into account in these kinds of studies, or, you know, how are they going to react to messages. How is the general public going to react to messages that are really being designed to be delivered to special populations, because it's very hard to segregate who in fact gets exposed to the different messages.

These are just some of the research needs that I see in this area, and I think that is all for now.

Discussion of Papers

DR. GUZEWICH: Thank you, Alan.

The program now calls for a panel discussion. So if I could ask our four speakers to come to the front table here, and for the microphones to be turned on on the front table, we can ask the speakers to discuss among themselves for a minute and then I'll open it up for questions from the audience here.

First, I'll ask our panelists if there are any follow-on comments or questions they have for one another. No rebuttals or other comments?

MR. SCHMIDT: I have a question for Alan. Maybe how much money is allocated

towards the type of research at FDA, and if you have knowledge, at USDA--the consumer behavior research?

DR. LEVY: Actually, for the first time in a long time we actually had a budget last year to do consumer research related to food safety, and a lot of this work that--I haven't talked about the activities they're actually doing. We're actually doing most of what I'm proposing here as what you needed to do, and our budget last year was about \$300,000.

My understanding is we have much less than that this year. But until recently, that was the primary, except for some of the activities in the private sector. There wasn't very much else, consumer research going on within the Government, but recently, as part of--I know that some of the CSREES competitive grant proposals are actually consumer research activities, and I know CDC has committed a fair amount of money to consumer research activities. So, really, for the first time, we're seeing other places within the Government which are sponsoring this kind of stuff.

DR. GUZEWICH: Okay, thank you. I'm going to ask for questions from the audience, but I will ask you to use the microphone that's provided in the back of the room and identify yourself since this proceeding is being recorded.

DR. SNOWDON: I'm Jill Snowdon with the Egg Nutrition Center and I do want to compliment the selection of the panel members as well as the presentations as getting into some of the "nuts and bolts" of what's going to change behavior, that then may give additional protection and reduce disease burden. So I think that you've started to get into some of the things that have been overlooked. So I'm appreciative of that.

I have two kind of technical questions. One is are there any comments, particularly with regard to the presentation on transportation--do we have any kind of sense of the technology that's available? Are we up to speed? Is the technology available, that we can measure the temperature of products as they're moving through the distribution chain? I know you made the comment about the satellite. But I mean, do we need research that gives us the tools in order to start doing some of that measurement?

DR. CARPENTER: There are a number of instruments that are available to put within a load, when the trailer is sealed, and it will measure the temperature at that particular spot in the load. Unfortunately, it only measures one location within the load, so placement of it is very critical.

So just to say you have recorded the temperature as it went down the road really does not adequately explain it. But it is a step in the right direction; yes.

DR. SNOWDON: And then my other question is with regards to approaches for communication and education, does anybody know the status on the Extension Service? We used to use Extension agents considerably on food safety education, and working with pesticide issues, there was kind of a general dismantling of the use of the Extension agents. Is that an option for consumer education, where we possibly already have the Government infrastructure, but maybe with revitalization of it, that it would help?

MR. SCHMIDT: Certainly, from IFIC's standpoint, the Extension agents are a key audience that we try to get our materials to and I know we see a lot of columns that they write in local newspapers, and I think they do a valuable service here, but I would say that there is probably a lot more that could be done there.

But they're certainly very important to our needs.

MS. DeWAAL: My comment on that, Jill, is that we need to get away from the perception of this being an agricultural issue. It is really a public health issue and the Extension Service has done a phenomenal job in educating farmers. But to make that transition, they would need to become something other than simply Extension agents.

So, again, we're communicating, we're taking from kind of a farm audience, and now communicating to a much bigger audience.

DR. SNOWDON: Thank you.

DR. CARPENTER: Let me just add one thing to that, and in the matter of regulations--well, we don't want to even talk about regulations--guidelines for things like transportation, it is absolutely necessary to go out into the industry and let them help generate whatever guidelines are there, based on what practices they are doing now.

DR. GUZEWICH: Next question, please.

DR. ROBERTS: Tanya Roberts in the Economic Research Service in USDA. I'd like to follow up on a combination of the transportation issue and behavior change issues.

For over a decade, I've heard about these time-temperature integrators that are supposed to work for like a nickel apiece, so why aren't there sort of contractual relationships requiring that maybe twenty of them be used in a truckload?

The question is, is it a liability problem, is it an information problem? How do we change producer behavior? And I'd like to hear from Alan Levy as well as the other members of the panel on what they see as possible solutions for what's going on here.

DR. CARPENTER: Well, as far as the time-temperature indicators, yes, they are used. they don't use as many as twenty. Some require one and some require several placed throughout the loads. But let me say that this is no substitute for good transportation practices that need to go into effect by the operator, because that's the key person. They have to be trained and they have to be diligent in preserving the temperatures that they need to preserve.

DR. ROBERTS: Well, you were even suggesting in your talk that maybe they try to find ways around it, so they can meet sort of the minimum requirements, but, still, they haven't really adequately done the job. I guess I don't quite understand the issue here.

DR. CARPENTER: Well, it's difficult for me to answer your question if you don't understand what you're asking.

DR. ROBERTS: I don't understand why we aren't assured that the meat that's transported in these trucks is going to arrive at an appropriate temperature at the other end of the line, you know, and you were suggesting that there were some problems, and need to train transporters into better practices, and I guess I don't understand why the time-temperature integrators aren't

working, or what new research we need either to make the monitoring system better or to change producer behavior, to give them the proper incentive so that the system will be working, appropriately.

DR. CARPENTER: My answer to that would be to change the behavior and somehow reinforce the proper behavior of the humans involved. It's not a mechanical problem, in most cases.

DR. LEVY: To respond to Tanya, producers, when you ask them, talk a lot about being consumer-driven, and they would argue that most of what they do depends on what consumers really want, and one of the real values of information kinds of approaches is that to the extent consumers understand and know more of the issues, they are much more in a position to express their desires for safer food.

Consumers want safer food, there's no ambiguity about that, and to the extent they understand, you know, what are some of the ways in which food can be made safer, they actually become effective advocates, which the industry would actually listen to, to motivate change.

It's one of the, I think, the real advantages of information kinds of regulatory strategies, is the consumer's actually in a perfectly good position to have influence on producer behavior, and if they want it, producers will do things to satisfy that demand.

MS. DeWAAL: I want to comment on the transportation issue. The trucking industry is a highly regulated industry. These people have to be specially licensed, the rigs have to be specially licensed, sometimes by a number of states. They're subject to weigh stations.

I always wonder why in fact people aren't specially licensed or given a dedicated truck to deal with food.

I mean food is highly perishable, it needs, frequently, intensive refrigeration. We do have technology that should allow for monitoring the temperature in the truck, so the kind of cutoff of temperature shouldn't be allowed.

There are also weigh stations along the road. They're regulated by the Department of Transportation, by the states they drive through.

So the idea that the best we can do in the transportation industry is to have guidelines for truckers seems absurd.

I mean, we should be able to have much stricter standards for the transportation of food by rail, by truck, by air, than we have today, and it's a real gap in our system.

I remember when Mike Taylor was brand new at USDA, and pointing out to him that there was no mandatory requirement, temperature control requirement for the shipping of red meat. There is for poultry but not for red meat, and they're still trying to work to address that.

So this is an area which is very under-regulated in the food context, where the industry itself is highly regulated and should have more in this area.

DR. CARPENTER: I might respond to that by saying that the vast amount of perishable food in this county is shipped with no problems. So what we are talking about isolated incidents.

When we take particularly the large meat shippers, they have their own HACCP programs

and their own guidelines for the cleanliness of trailers, the temperature at which it is to be shipped and so forth, and they are very concerned about additional regulations because these regulations would be directed toward the few callers that do not pay the particular attention that they should to the loads that they haul.

DR. GUZEWICH: Next question, please?

DR. BAILEY: My name is Dr. William Bailey from the University of Arkansas. I want to thank you for pointing out that the consumer is an integral part of the process of research. I really do appreciate the sharing of the information from Mr. Schmidt about the radiation studies. I have done a number of those myself.

However, I would like to say that separating scientific-based research from other type of research and the social scientists is sort of inaccurate. I believe the social scientists have their own particular methodologies that are as valuable in many cases as microbiology.

My basic question is: How can we improve the funding of this sort of research? There are large numbers of individuals like myself who are consumer behavioralists who are seeking funding for this specific type of research, but fail to get access to the money for these types of studies, and they are expensive.

MR. SCHMIDT: If I could respond, too, and say that I think part of the issue is just getting the attention. Too often, having been in a Government agency, you see that consumer education is almost looked at as a token add-on, after you have done these other things. So I think until it gets the respect and the high priority that I think needs to come out of this conference and other forums, it is going to be an add-on, and add-ons do not typically get the amount of funding that the central ones do.

I certainly did not mean to diminish the respectability. If anything, I feel like there ought to be more support for this type of research, but I just do not think you often see consumer research treated with the same level of funding as you do the scientific research.

MS. DeWAAL: I would also add that there is money. I mean, this conference was held because a lot of research money was given to USDA. That is why we are here.

In addition, the President's food safety initiative has this kind of education as a primary component, and they got \$75 million of funding for that initiative last year.

Congress, believe me, is very willing to pay for consumer education and research. We have a much harder time funding inspectors, particularly over at FDA.

So you simply need to get your messages to the right people, but the funding really is there, and perhaps an outcome of this conference is more focused on some of this research.

But, again, consumer education is one piece of a puzzle, and it should not replace the need for controls and preventions where those are available.

DR. GUZEWICH: The next question, please?

MR. HORN: I am Floyd Horn, Agriculture Research Service, and I have a question primarily directed at David Schmidt.

It has always been a puzzle to me as to why irradiation has not been more reasonably

accepted in the U.S., and particularly in a country where we are from time to time recalling tons and tons and tons of meat and essentially destroying it.

In the slide that you threw up on where people get their information and where they get the information they trust, you had newspapers and magazines, but what happened to television? That is where they get the bad news. Why can't we launch an effort to take a technology like irradiation and explain to people that it is not much different in many ways from their microwave oven or their tanning booth.

MR. SCHMIDT: I agree with your take on that. I think, overall, one of the things that has prevented irradiation from getting into the marketplace I think is not so much consumer perceptions, but industry's perception of consumer perceptions. By that, I mean, there have been studies.

I was at the USDA 10 years, and we had studies at that time from California, Georgia, indicating that when you demonstrate irradiation, you get a lot of support for it in specific markets. I think there has just been this fear among industry that consumers are just going to dismiss it because of some highly publicized activists who have done a good job of keeping it out of the public sector.

But I think now what has changed is, again, when I talk about the personal risk assessment. Consumers are now ready to consider this because they are so concerned about the microbial illnesses, but I think one of the ways to get this into the public is it may get more of a priority.

I know I was disappointed early in this administration. There seemed to be some push for food irradiation, but then it was sort of taken out of the food safety initiative. As I said, I think it is not part of the Fight BAC Campaign.

Whenever FDA finishes the irradiation rule, it seems like that would be an appropriate time to revisit the issue of incorporating those education strategies into the food safety initiative.

MS. DeWAAL: Just one comment on that, irradiation. I do not believe that the viewpoints of a few consumer organizations--there is one well known, one up in Vermont actually--that oppose it really has that much to do with consumer acceptance.

However, I do not think the irradiation should get a benefit that is not given to every other new technology or potential technology to improve food safety, and I would caution the Government about getting involved in some kind of educational campaign for consumer acceptance of irradiation when we do not necessarily know there is a problem, when they might have to do the exact same thing for every other technology.

It is not appropriate. We should not be cheerleaders for different technologies. They should do the approvals that they need to do. They should assure the safety, and then they should let consumers make a decision in the marketplace.

DR. SCANES: Colin Scanes, Iowa State University.

I would like to go back to a point which was made a little earlier in the discussion period, and that was relative to extension.

It was intimated that perhaps extension focus almost entirely on farmers and extension could not or does not involve itself with consumer education.

Speaking as someone in administration at Iowa State, I would like to mention a couple of things that we are doing which point to the very strong role that extension has and how extension has changed.

First of all, we have a--and this is going to sound trite, but it is also true--a seamlessness between research, teaching, and extension. Researchers get out into the field. Extension faculty have research appointments. There is a lot of cross-talk.

We have extension heavily involved in our distance education programs, and those are not focused on the agricultural industry, albeit very important in Iowa, 25 percent of the economy.

We see it involved in business, in manufacturing. In manufacturing, extension is taking the lead in the Year 2000 problem, which is certainly way outside the constricted view that some may have of it.

In the area of extension, we are seeing a strong involvement in families, involved in welfare reform. In terms of youth and families, certainly strong roles in nutrition, health, strong links to the medical community, and I think that we can see that extension is also heavily involved in food manufacturing.

Certainly, in Iowa, we have a manufacturing industry center, which brings together researchers, teachers, and so I think we have got a very strong system that certainly we can build upon. Certainly, we can intensify and have greater focus in the area of consumer education, but at this stage, I think the glass is certainly well more than half full, and I think we should build upon that strength as perhaps one of the major thrusts in the area of consumer education, but also training at the level of restaurant, grocery stores, and, of course, K through 12.

DR. GUZEWICH: Merle?

DR. PIERSON: I am Merle Pierson. I am from Virginia Tech.

I would like to reinforce Colin and say that in fact, nationally, cooperative extension is more than just serving farmers. It transcends that, and there is a service to consumers relative to food safety.

Traditionally, through departments such as human nutrition in foods, it is a very widely recognized program. Departments of food science have very extensive programs that cooperate in consumer education, education of restaurant managers, retail, other food service areas, food industries, et cetera. So there is a pretty broad program that exists, and I just wanted to make sure that we understood that.

I might say, too, that USDA CSREES has a food safety extension education program, and that has been funded for about \$2.3 million.

Now, Congress for this fiscal year has increased that by \$5 million to a total of about \$7.3 million. So, actually, that program will be ratcheted up.

Thank you.

DR. GUZEWICH: I think we hit a nerve there on the extension of education.

MS. DeWAAL: Yes, and I appreciate the comments. There is a huge job here. I mean, when we talk about education, this is huge. I think the best analogy was the food system being a tree and the producers are the roots and the production, processing, and slaughter site are the trunk, and then the consumers are the leaves at the end of the tree.

We have got retail. We have got restaurants. I think extension probably has a huge job in just training the trainers, getting educators prepared. I mean, there is just a huge amount of work to get this stuff out to the public and to the school system. There is a huge amount of work here.

So I am not saying extension cannot do it, but there is also my hesitation about putting any one agency or group in charge of it. There are times when you have got to deliver some real bad news, and we saw an example recently where FDA was trying to issue, I guess, a press release informing high-risk consumers, they should not eat alfalfa sprouts, and two-thirds of the press release was on every possible innovation in the sprout industry that in the future might make sprouts safer, but the message about the high-risk consumers really was not effectively presented because the agency was so--I don't know. I don't know what their thinking was.

I mean, CSPI had to release a second press statement in order to get a clear message out to consumers, and alfalfa sprouts have been responsible for a number of outbreaks now and they are not appropriate foods right now until we solve the problem for children and elderly consumers.

So there is a need to get that consumer education message out, but if the people delivering the message are so concerned about how the bad news will sound to industry, sometimes the message gets really garbled. So that is my concern.

If extension can do a better job than what we have seen from some agencies, then that is fine, prove it, but I am concerned about any agency having too much of a role to the exclusion of getting the message out.

DR. PIERSON: Yes. I actually have just entered into another discussion. I think the original discussion was related to cooperative extension only dealing with farmer issues. So you sort of went off here.

I want to say that actually, interestingly enough, food safety education now is in fact looking at coming closer into the farms and the issue of education relative to the GAPs. It is, in a sense, kind of a first in terms of food safety education and our on-farm practices.

So, in fact, it is a little bit of a revolution that now food safety is going back to the farm. It is transcending the entire food system, as it should.

MR. SCHMIDT: I was going to mention, too, just to add on this issue of agriculture being perceived as farmers only and that whole thing, I serve on a steering committee called Reinventing Agricultural Education for the Year 2020, and we are looking at these very issues of how agricultural education is perceived as just dealing with farmers and crops, et cetera.

There is a whole image. I think I agree with some of what Caroline is saying. There is this image that agriculture doesn't do everything that we know agriculture does, and the American

people have no idea of how broad a role that agriculture plays.

I think to try to integrate in your messages that agriculture really is about human health, not just food safety, but a lot of the work that is being done to isolate phytochemicals in foods, plant items that can improve human health, and this whole new trend of functional foods is really an exciting area, and I think it gives you some springboard to really make your case to the public a little better than has been done today.

DR. GUZEWICH: Next question?

DR. CUSTER: My name is Carl Custer with FSIS.

I have got both good news and maybe some bad news. The good news is I am really glad to see you people addressing research for consumer education and motivation. The bad part is that a good and well-educated consumer then moves into their fairly antiquated kitchen or bathroom, which really is not designed very well for food safety.

I doubt if any of our kitchens would meet minimum retail standards, and certainly not USDA standards. This is a question for the next 5 years, 10 years, and that is how do we motivate researchers, bureaucrats, everyone, architects into both remodeling kitchens, new ones, and new-designed kitchens for better food safety.

DR. GUZEWICH: No one leaps at that question.

MS. DeWAAL: Carl, that is a great question, and I am going to answer it with another question. If we took one education message to get to consumers--consumer education is very difficult. So let's say we just decided on one message. I think that message should be on hand-washing.

The most shocking data--and I was surprised Alan did not mention it. He mentioned it somewhat with the data coming out of public rest rooms, about the percentage of people who were washing their hands, and it was shockingly low.

So we have a really basic job to do on something so fundamental, to food safety, and to public health. So I think if there was one message--and I am the food safety person. So I will probably talk about contaminated turkeys or something, but if there is one message we could really get out in the next 5 years, I think it should be a message on hand-washing. Hand-washing is vitally important, and somehow they do not get it.

DR. CUSTER: But that is the issue. That is the issue.

MS. DeWAAL: Right.

DR. CUSTER: Kitchens and bathrooms have very poorly designed sinks and faucets. So that, once you turn the water on, wash your hands, then you have a contaminated handle. That is one of the issues, but the rest of it, of course, is the kitchen design.

I agree, and we would like to say also Charles Otto, formerly with FDA, often said most foodborne disease is handborne disease, so thanks to Charles.

DR. LEVY: Let me just respond a little bit to that. It is obviously a very, very difficult problem. Design of kitchens is driven by a lot of factors. Food safety is not currently high on the list of important factors, but that could change, and in our tracking surveys, for example, we see

that 65, 70 percent of home kitchens now are using antibacterial products. That is compared to essentially zero, 5 years ago.

There is a tremendous demand for food safety in the home kitchen. You have a consumer demand, and what you need is some innovation that addresses the other important factors that control design of home kitchens, but I think there is a demand among consumers for food-safe kitchens. There is a market there that should be explored.

DR. GUZEWICH: Next question, please?

MS. TAYLOR: Hi. I am Melissa Taylor with the Cooperative Extension Service at North Carolina State University, and mine is more just a comment.

I am going to be making some comments this afternoon, but I did not know how many people would be after lunch. So I just wanted to reiterate what Merle and Colin had said about the extension being more than farmer education, and that hit home to me because my primary responsibility in extension as a specialist is working with the agents, the family and consumer educators, home economists. They probably would be very upset to know that they were not included.

I think they are a very important group because they have the potential to reach the audience that we are speaking about. In North Carolina, we have worked very hard to bring our agents to another level, especially in food safety training. So we have worked with a group of agents and given them a greater knowledge of food safety, and they in turn go to the counties and work with our health departments and our health inspectors. We are doing more of what Caroline had said, work on public health, and the agents are the ones who can do that because they can reach the audience.

And extension is not trying to do it alone. Extension has a great success, a great record of working with the governmental agencies, and I just wanted to put that on the record.

DR. GUZEWICH: I think Caroline has received some education here this morning on the role of extension.

Any rebuttals?

[No response.]

DR. GUZEWICH: Next question, please.

MS. ANDREWS: I am Jan Andrews, and I represent a strategic research initiative in the State of Illinois for the Council of Food and Agriculture Research.

In line with that, one of our efforts, our planning efforts, is to educate, to work with low income, especially the WIC program. One of the issues, one very simple one was we were going to think about using a chlorine solution, a very mild one, for sanitizing and disinfecting, but I was a little concerned about your comment in terms of that.

So could you give me a little more? We need something very cheap, very inexpensive for this population, some very concrete recommendations for low-income populations.

MS. DeWAAL: And you are talking about for sanitizing counter tops?

MS. ANDREWS: It could be sanitizing counter tops or taking off from Headstart where

we are doing that kind of rinse.

When you said that, I was a little concerned about maybe we should not be using that in our Headstart centers either.

MS. DeWAAL: I think a mild chlorine rinse for counter tops, for toys, I mean those kinds of things where they are allowed to dry completely--part of the problem is poultry retains some byproducts from the chlorine. So it is a slightly different issue.

We do not advise consumers, though, to rinse their fruits and vegetables in chlorine, and you would be surprised at how frequently I am getting that question right now. That is a practice in some third-world countries, and now as we are hearing more about fruits and vegetables, we are being asked that.

So we do not recommend it for food, for rinsing your food, but for counter tops, for sanitizing counter tops and things like that.

MS. ANDREWS: What about dish rinse? That is what we have been using in some of our centers as dish rinses.

MS. DeWAAL: For dishes, yes.

MS. ANDREWS: Rinse, you know, mild.

MS. DeWAAL: Yes, and if you fully wash it off.

MS. ANDREWS: Are there any national standards for what that proportion is supposed to be that you know of?

MS. DeWAAL: No, but the Food Code would probably have it. We can look it up.

DR. GUZEWICH: You can look it up if you go to the FDA page, the Food Code. You can look up the requirements right in there for restaurants.

Next question, please?

DR. LEE: Yes. Mark Lee with the California Department of Food and Agriculture.

I was kind of interested to hear about what was going on all day yesterday and this morning's panel discussions.

I do recognize that there is a great deal of research that needs to be done in both basic microbial food sanitations and foodborne illnesses, as well as a social science that needs to be changed or message being delivered.

One thing that was kind of interesting to note, that there was one thing mentioned about--actually just two words, one on cost benefit analysis and the other one is a bill of lading and the transportation. I think that those two really speaks loud as far as when we talk about the risk assessment analysis.

One major effect that affects the public is a cost, and all the things that we talk about here, research and public and Government policy and implementations and enforcements and whatnot, they cost.

If you start adding those measures, I think the food cost is going to go up, and that kind of creates a couple of things. There is going to be a population who can afford high-cost food. There is going to be a population who is not going to be able to afford that.

I think that is a good example for remodeling the kitchens. Nobody can afford \$30,000 to remodel your kitchen all the time, just to get the foodborne illness, when you can wash your hands just as easily.

The question following that comment from David, have there been any studies actually done to specifically address each measures that reflects risk versus benefit correlated with the cost benefit, as to whether the public is willing to accept that or pay for it directly out of their pockets or public tax dollars or whatnot?

MR. SCHMIDT: I do not know that I can answer that completely, but I do know there have been some good studies done that were actually USDA-funded at Cornell University when I was at FSIS in terms of what are the practices. I believe the ERS has done some cost analysis, but I cannot give you any specifics on that.

I don't know, Alan, if you know a little bit more.

DR. LEVY: One of the requirements of the regulatory approval process is that you have to prepare a cost benefit analysis demonstrating what the cost and appropriate benefits are of whatever interventions you are proposing, and it is really to support those kinds of activities that a lot of research is dedicated.

There are two basic approaches that is the main benefits. One is the avoided health cost approach where you simply calculate how many illnesses you are preventing by virtue of your intervention, but there are other kinds of ways to estimate benefits which are based on to what extent the public thinks that it is being well served, based on the satisfaction and consumer confidence.

So we are looking at both of those kinds of approaches as ways of estimating benefits.

MS. DeWAAL: One of the costs that needs to be considered is the costs that are already built into the system.

If you have a heavy load of foodborne illnesses, if you have to stay home from work, if you have doctor or hospital costs, those are costs we are already paying.

Consumers have told us that they are willing to accept slight increases in food cost to achieve food safety benefits.

The big question about irradiation, the industry may frame it in terms of consumer acceptance, but that is really a cost issue. Some of the estimates is that it is going to cost a couple more cents a pound for irradiated product.

So then we may in fact have different levels of safety represented in the marketplace by different cost products. The rich may afford one safety level. The rest of us may afford others.

So we have to be careful as we proceed down this road to make sure that safety improves overall and that we do not put all our eggs in one basket that may be a very high-cost basket.

DR. GUZEWICH: Just to follow up on the last question the other lady asked there, some of the research that FDA is funding in the food safety initiative is to look at methods for reducing risks at the retail and consumer level. It is going to be university-based research.

Next question, please?

MR. DEACON: My name is Bob Deacon. I am with Novus International.

The program that Alan Levy laid out for market research there is an outstanding program. It is a textbook coverage of the issue, I think. The \$300,000 that was your budget is de minimis amount of money.

There's probably hundreds of companies in this country that spend more than that and do not achieve what you lay out, but my question is, is what you do publicly available, and if it is not, why isn't it? And if it were, I think you would have a better chance of getting some money for it.

DR. LEVY: Almost all of it is publicly available. Not only are the reports publicly available, the actual data from the tracking surveys is publicly available. Some of it is on the FDA web site.

A lot of it has been done in very recent times, and it has not quite gotten into the public--it has not been publicly disseminated yet.

The most recent survey which we just completed, we did this summer, it enables us to identify what has been going on since '93 in terms of knowledge, attitudes, and practices related to food safety, and that data is going to be available in a couple of months, but there has been a lot of focus group research on warning label kinds of regulatory interventions and consumer advisories in restaurants, and all of that is available at the FDA web page.

DR. GUZEWICH: We have time for two quick questions. We are coming to the end of our question period here. So I will ask for two quickies, please.

DR. ROBACH: I will ask one quickie, then. How is that?

I am Mike Robach with Continental Grain Company. I wanted to make one comment and ask one question.

First of all, from a producer standpoint, in regards to irradiation and other intervention strategies, the comment was made that producers say that they are consumer-driven. I think you need to modify that and understand that producers are customer-driven.

You have to take into account the integration and who we actually produce for when you start addressing some of these issues.

The other comment is in relationship to public health focus. I agree that intervention strategies and research should be based on a public health focus, and what is important is that we have to have measurements to really judge these interventions in a public health context. That way, we can establish priorities to more effectively use the limited research dollars that are available.

It is often one thing to get caught up in all the excitement of new technologies, without realizing what the real benefit is, not to mention the cost. I just would like to have a response on that comment.

Thank you.

DR. GUZEWICH: No one is jumping on that one.

DR. LEVY: Well, I agree totally that customer-driven is much more appropriate. Not all companies in the food chain are producing for direct to consumers, and I was mainly thinking

about those companies that are the direct suppliers to the consumers, but there is lots of other companies in the food supply chain.

Their concerns in relation to safety are mediated, and ultimately, I think that consumers do make a huge difference, even further down the chain, but there are all these issues, not the least of which is viability shifting that goes on within the chain.

The other question?

DR. ROBACH: I just think the other point was really to establish measurements based on public health impact.

We talk about a lot of things, but when all is said and done, have the interventions that have been incorporated--have they really had an effect on public health, given all the other variables that we have been talking about this morning?

DR. LEVY: There is this really significant effort by CDC to strengthen the foodborne illness or surveillance system, and I think that is a serious down payment to strengthen the system so that we do have better, essentially, outcome measures that we can evaluate these impacts by, but that is a serious need in the future as well.

DR. GUZEWICH: We will take the last question here, sir.

DR. LEIN: Don Lein, Cornell University from the Diagnostic Lab of the Veterinary College.

Just two things, quickly. Selected populations that Levy brought out here, there is an interesting experiment going on now really with help for at least the New York City poultry markets and live animal markets that come about by a disease factor. That is even influenza that has been there, the form that really is not highly pathogenic today in birds, but could transform over into possibly what could be in Hong Kong, at least that fear by public health.

But that has set up an integrated system to look at vertical integration from the farm to those areas because basically that marketing is owned and goes back to local farming for production of that husbandry. So poultry and some young kid goats and other things that would be taken to that market, there is close to 80 markets in New York City, and they are multi-ethnic. So all the different ethnic groups are there.

So the Department of Agriculture in New York State, along with USDA APHIS and along with the Health Service have combined--and I just wanted to bring out that this combination, I think, is the exact thing that we need because we are looking at really everything from the farm down to the market. It has opened up the possibilities, of course, of looking at other things and just even influenza. So, when you correct one thing, you start to correct other things that deal at least with the enteric problems.

The second thing I wanted to bring up was we just had a recent meeting and conference at Cornell University with the food science people and the Veterinary College and Public Health. That has dealt basically with food safety.

One of the things that was quite interesting out of the public health group was the groups basically that are most susceptible, children, adults, but the day care centers where a lot of the

food problems that took place in there were correlated to children, changing of diapers and those same people doing food handling--and this seems to be true at the homes, too, where there are young children.

So, again, I applaud you for hand-washing being a very big thing that we should get across in education that is very simple to do and basically would change a lot of our problems for us.

Thank you.

DR. GUZEWICH: Thank you.

I want to thank the panel for their involvement and the audience for their involvement.

DR. WAGNER: Thank you, John.

Two quick comments about the public comment section of the program, which will begin after the break at 10:30, if you have not signed up to make public comments and you wish to do so, we will try to accommodate you in the time available either at the end of the morning session or in the afternoon at the end of the scheduled people who have already signed up.

Also, if you want to submit written comments in addition to or in place of oral comments here today, you have until November 30 to submit written comments to us, that is, CSREES, for inclusion in the final document.

With that, we will all wash our hands before we take the break, I guess, and see you here at 10:30.

[Recess.]

PUBLIC COMMENTARY SESSION VI

DR. DONNELLY: My name is Cathy Donnelly from the University of Vermont, and I am very pleased to serve as the moderator for this session.

We will need to limit the public comments to 10 minutes per individual so we can allow time for each individual who has signed up to give comments.

You should have all received an outline of groups that wish to make public comments. If you did not receive one of these, there are some extras out on the table in the hallway.

At this time, I would like to invite Steve Crutchfield from the Economic Research Service to the podium.

We will have a change in our program and we will invite Tanya Roberts from CAST, not ERS.

DR. ROBERTS: We just came out with a new report. You have probably seen the interpretive summaries on the counter out in the back, and there were a few actual copies of the whole report available, but I see that they seem to be gone.

At the bottom of the slide, you cannot see that you can download the whole report from the CAST web site. So it is readily available to everybody that wants it.

This was an update of a report of the review of the recommendations that we had done earlier, and this also is on the web as well. What we tried to do in this report, we did not review the findings, but we were looking at the research recommendations and trying to give a little more detail to update them and review them.

On this particular task force, there were 18 committee members, and Beth Lautner, Mike Doyle, and Caroline Smith DeWaal, who have been speakers here today in this conference were among the 18 members.

The first point is that information remains the critical food safety problem because the public cannot detect the pathogens in the food supply, and that applies really to everybody in the whole food chain. That affects the kind of economic incentives and other incentives there are.

The second point is that linking human illness to foodborne pathogens remains difficult, even though we have the new FoodNet data that will help. It still is a complex issue.

Also, the third point in sort of the overview is that because we are trying to look at the whole farm-to-table food safety chain here, it does require a variety of scientific expertise.

We want to emphasize again the importance of risk assessment for food safety policy both in the public sector and the private sector. We tried to give a little more detail of what we thought the different responsibilities were of the two sectors.

In the public sectors, they are responsible in our eyes for primarily national human illness estimates. They also do basic research on pathogens, and they are responsible for effective and efficient regulations.

The private sector is responsible for controlling their food production processes and developing new controls because they know best what they do and how to make improvements.

The new research recommendation here is the third one about the joint responsibility for both the public and the private sectors to work together to apply risk assessment in order to enhance food safety.

This may be the most important recommendation in the area that we need to be much better at clearly setting priorities and setting food safety goals.

We have heard a number of different people's lists of what kind of research needs to be done, and we think that we need to have a better consensus on what the extent is of human illnesses, deaths, and disabilities.

We need to not fight about this, but agree on if we have information gaps, where should we go out and get more information. So we need to have a clearer idea of what is the nature of the problem we are trying to solve.

We also think it is important that we develop a consensus about the criteria we are going to use to judge the importance of various food safety problems. Are we really trying just to prevent illnesses? Are we trying to prevent deaths? Are we concerned about who it is that becomes ill? Is that the primary concern for some of these pathogens?

Economic cost is also another way that you can rank these things. So we need to discuss which are the most important to us, and in order to do that, we think that it would be useful to

have a national consensus conference about the criteria for which are the high-priority pathogens and developing this consensus about what the current level of problems is.

We have heard a number of discussions here about the importance of pathogen databases, and we want to emphasize that we really think that if you are going to do good risk assessments, you have to have good data.

What is new about this recommendation this time around is the idea of the joint responsibility between the public and private sectors because each one of them has data to contribute and has research that they are funding that could answer some of these risk assessment questions.

Another part of the recommendation that is new is the possible role for scientific societies, professional societies of various kind, and that could be either in setting the criteria for what would go into the databases, like looking at the testing of criteria or minimum sampling protocol, how the data might be blinded. They could play a role there in doing the blinding, or they could do a role in working with various industry or trade association groups to try to assemble databases from both public and private sources.

Another new recommendation is that we need to make sure that when we report data that we are not just saying what is the average for the impact of a particular control or technique, but we are really showing the whole distribution, and that we encourage that this be published more in the literature and perhaps even the more database be made available whether it is on the Internet, et cetera.

So we need this whole distribution of data points in order to deal with the variability and uncertainty in our models. The variability just looks like what is the difference between one particular strain of *E. coli* 0157:H7 and another strain. I mean, are they equally sensitive to heat? Which ones are more acid-resistant?

There is some interesting work that Dick Whiting has done that has looked at the response to temperature for the different strains and the outbreak strains seem to be relatively hardy.

The whole idea of economic incentives is a new one, and we added this to part of the recommendations. Economists think of innovation as having three stages that are very important: invention, the commercial scale-up, and industry adoption. And we need to look more clearly at what are the economic incentives for all three stages of innovation and how we can foster that.

We have had some discussion earlier on labels, and I think that labels and certification are an under-utilized marketing strategy. That would definitely make it clearer to everybody in the food chain as to what the safety level was.

One of the key issues here is what level of safety is at our target. Are we going to require 10^3 reduction from a certain technology in order to get a safer label, or is 10^5 going to be required? It is unclear exactly how this would be implemented and what would be effective from a microbiological point and consumer acceptability, et cetera.

The third point is that we need to look more clearly at both the public regulations and the private sector on how we can increase the economic incentives for providing safe food.

This is the last recommendation I am going to highlight. I mean, we have 45 pages worth. So I am only giving you a few of the highlights here.

We had a recommendation before on educating the public on food safety. This time we added the importance of also educating the food safety professionals, and as Alan Levy mentioned, you can study how to motivate behavior modification and measure behavior change by all food handlers, not just consumers, but producers and everybody else in between.

We did recommend that we continue the joint, public, and private education programs, of which FightBAC is an example, and lastly, that we want to emphasize the importance of increasing higher education of food safety professionals in risk assessment, both for risk assessors in the public sector, as well as the private sector.

So I hope I did not exceed my 10 minutes.

DR. DONNELLY: You did not.

DR. ROBERTS: I don't know. If there is a minute or two, is there something that either Beth or Caroline would like to add? I don't think Mike is still here.

[No response.]

DR. DONNELLY: Thank you, Tanya.

The next public comment will be delivered by Jan Sergeant from Kansas State University.

DR. SARGEANT: The group I am with is called the Food Animal Health and Management Center, and we are part of the College of Veterinary Medicine at Kansas State University.

Our mandate is to do on-farm research in food-producing animals, and a number of the projects we have ongoing involve food safety, but what I wanted to do today was to run over some of the work we have been doing with E. coli 0157:H7 in range animals.

We have heard a lot about on-farm food safety in the last few days, and much of it involves the dairy and the beef feed lot industries, and there are some obvious reasons for that.

Range animals are less studied because they are not confined in the sense that a lot of other production species are, and, therefore, there are some logistical difficulties in working with these species.

So, basically, what I wanted to do was just quickly run over some of our results to highlight some of the similarities and differences between what we find and what are found in other cattle industries.

This picture shows kind of a fairly typical day in the life, and I think it accentuates the fact that these animals are not confined. I mean, obviously, the pastures have fences, but they are fairly large, and the animals are free to roam at will.

It also shows them eating grass. For much of the year, this is their only source of nutrition, and it is more than adequate, but it means that the issues involving food and its role in E. coli 0157 are quite different. I just point out there that there is a tank water-er because we will come to them later.

I do want to just briefly talk about where the animals from our study came from because I

think that how you sample and how you try to identify *E. coli* makes a big difference in what results you are going to get.

We used 10 cow-calf ranches in Kansas, the Flint Hills area where the cow-calf industry is centered. They were not random because we needed a fair bit of participation by these products. So we proposed to select them. Five of them were fairly small farms, less than 100 cow-calf pairs, and five of them were quite a bit larger, greater than 300 cow-calf pairs.

And what we would do is every month, we would visit each of the farms and sample the animals on the range basically by sitting around waiting for the inevitable to happen and collecting fresh samples from 10 percent of the cow herd and about 10 percent of the calf herd, and then what we would do is try to identify the water sources that were available to those animals, sample from that, and then collect feces from wild life as we were able to.

All of the farms in the study, I should have mentioned, had spring calving seasons. That is fairly much the norm in this area, and so we began our sampling in December of '96, just prior to that calving season. We followed the cows for a full year, and then we followed the calves to weaning, which is in the fall of the year when they are approximately 6 months of age, and then as many as possible, we followed on from weaning to either market or the same-aged animals who were going on as replacement heifers.

Again, I do just want to real quick go through how we identified *E. coli*. Dr. Doyle presented some of the reasons for these different steps yesterday, which saves me having to do them, but I think it does determine our results, how we look for it.

We used a combination of culture and PCR. The reason for that is we are concurrently doing the field validation of this particular PCR assay in feces. At the moment, we are using them concurrently, and our hope eventually is to use the PCR as a presumptive screening test to speed up the whole process.

Our culture uses a couple of different enrichment phases as well as immuno-magnetic separation to try and allow specifically *E. coli* 0157:H7 to grow. We use a number of incubation and media steps. We select non-sorbitol fermenting colonies, and we use latex agglutination to confirm both the 0157 and the H7 antigen, as well as API strips to confirm that the isolate we are dealing with is in fact *E. coli*.

The PCR analysis targets the AE gene, and at the moment, the way we are using these tests, we are saying that an animal is positive, if there is a positive on either or both tests, and for that reason, our prevalence is maybe slightly higher than some of the other tests you would see.

So, if we look at the cattle--and I think that this graph really highlights what we heard yesterday for the other cattle industries--it is that it is fairly ubiquitous out there.

We found the prevalence of 3.2 percent in our cow samples, 2.9 in our bull samples, and about 6 percent in our calf samples, a little bit higher as others have found.

If we break down our calf samples into pre-weaning and then the post-weaning choices, which is staying home but remaining on pasture, staying home but going into some sort of background in your feed lotting process or being sold away to a feed lot situation, we can see that

in all of these situations we are finding a fairly low level of prevalence of *E. coli* 0157:H7.

Interestingly, all of the farms that we sampled had at least one positive animal, again suggesting that it is very ubiquitous in the cattle populations.

Because of the way we sampled, sampling about 10 percent of the cow and calf herds every time we visited, it happens that a number of animals are sampled on more than one occasion. So what this slide is supposed to show is the percent of the animals now rather than the samples, the percent of the animals that were positive based on the number of times we happen to sample them.

So, for instance, out of the approximately 800 cows that we sampled once, there was a prevalence of 3 percent.

Out of the, more or less, 300 animals that we sampled on two occasions, 7 percent were positive at least once and so on, and what this shows, I think quite clearly, is that the more we look, the more we find.

Interestingly, only one animal out of the ones we sampled was positive on more than one occasion. This animal was sampled six times, and the second and sixth sample happened to be the ones that were positive, and they were separated by about 250 days and several negative tests.

So, again, this highlights what we have heard before that it is quite transient in nature, and animals may be fecally shedding one day and not the next.

An issue that I think the cow-calf industry has to deal with perhaps more than confined animals, perhaps not, is the whole issue of water, and there is a number of different sources of water for these cattle, but it is not infrequent that they either use as a water source or at least have full access to ponds and streams.

These sources of water are obviously not restricted to any one farm, and the watershed zones encompass not only a large number of farms, but often also areas where people live. I think that is a consideration that we need to be particularly aware of.

So, as I said, we did look at water sources. The tanks, which is what you saw on the first slide--you have a metal or a concrete tank where the water is often brought to the surface by windmills. For the samples we took from those systems, about 3 percent were positive.

Cattle are often watered by using ponds. They may be natural, but as often as not, they are dammed up springs. Again, we had a prevalence of about 3 percent and fairly surprising consistency in the prevalence of *E. coli* 0157 in the various sources.

In creeks and streams, the prevalence was about 7 percent. We did not find it in pond runoff or in springs, but we had a very small number of samples.

In fact, these numbers are not statistically different, but I think what is really interesting about this is we were able to identify *E. coli* 0157:H7 in creeks and streams which are running water sources, and I think that that really ups the ante when we are talking about on-farm control, if it is possible for running water to serve as a vehicle or a transmission of this pathogen.

The final issue I wanted to briefly mention that I think we heard about yesterday, but is particularly important in the cow-calf industry, is that on the pasture, our animals are not alone. I

do not know if you can see this the way the light is, but there is actually a deer peeking out of the bushes there. This picture was taken during one of our sampling visits. He was in fact watching us take the samples.

It is not just deer. There are other wildlife species. You can see here the birds, and I show this to highlight that in fact sometimes this contact between the cattle and the wildlife is very physically close.

So we attempted to collect some wildlife samples. What we were aiming for is we figured we needed about 200 samples to get a decent estimate of prevalence, and we were able to do that for the deer samples. We got 212 samples and found a prevalence of 2.4 percent.

We also collected six raccoon samples. Now, six samples does not a prevalent study make, but one of the six was positive, and I think that what that tells us is that raccoons are capable of shedding this pathogen and therefore need to be considered.

We didn't find a pathogen in 34 wild turkey samples. Again, this is really too small a sample size to say much, and certainly, the speakers yesterday referred to work where it has been found in various species.

So, basically, in conclusion, the things that I think are important to the cow-calf industry--and again, this is just based on our study--is that all of the farms have at least one positive animal on at least one occasion, suggesting that it is a ubiquitous problem in the industry.

The prevalence, however, was very low, and there was a short duration of shedding, and that speaks to how we are going to have to sample animals in order to do research on this or to try and monitor the situation at the farm level.

Finally, we did find *E. coli* 0157:H7 in water sources, including running water sources and in wildlife. I personally think that this kind of changes the way we need to think about on-farm control in that it may be a little bit naive to talk about on-farm control in the singular, and that we need to be talking about on-farms control and consider the entire range environment possibly at the watershed level in our control schemes, and that is sort of the direction this work is taking.

Just because deer and water and cattle all have the *E. coli* 0157:H7 doesn't mean they have the same one or that they are transmitting it between each other. Our goal is to look more specifically at genetically typing the bacteria and seeing whether they are the same, whether there are dominant strains, how far down watershed zones this pathogen could spread, if indeed it can, and that is the direction we are moving.

Finally, I just want to show my acknowledgement slide that I use when I talk about this for two reasons. First of all, I want to sincerely acknowledge the participation of these people, but also to illustrate that the on-farm studies are logistically not easy. They are expensive, and they involve a lot of people.

They involve a lot of money, too, and the USDA has sponsored this research for which we are very grateful. As well as myself, a number of the other faculty and members of the Food Animal Health and Management Center have participated in this work.

The ranchers, of course, are essential to on-farm research. They have got to be involved.

They have got to be willing to help you. Certainly, the ones we worked with were excellent, and it has been my experience that producers are more than willing to help with on-farm research if they are interested in what it is you are researching, and finally, a number of field and laboratory staff who we count on to help us out with these studies.

That is basically what I want to say, and thank you for your attention.

[Applause.]

DR. DONNELLY: Thank you.

Our next presenter is Beth Lautner who will make comments from the National Pork Producers Council.

DR. LAUTNER: Thank you.

I am here today representing the National Pork Producers Council, which is the trade association for the Nation's pork producers. We represent about 85,000 producers through 44 different State associations.

I did present some of my comments yesterday. I have a little more detail to provide on some of those issues that I raised yesterday, as well as some pork-specific points to bring forward.

The National Pork Producers Council is very supportive of food safety research. We have been active in securing increases in funding for food safety research at the Federal level, as well as supporting research with producer checkoff dollars.

We have a pork safety committee that was formed in 1994, that provides oversight to our activities in the food safety area.

I just wanted to mention, we have been involved in food safety before 1994. We started a quality assurance program in 1989 that addressed residues and herd health issues, and are continuing to expand that program as more information is available. That is our delivery system to get information out to producers on food safety issues that they need to be addressing at the farm level.

As far as research investment, we started investing in pre-harvest research in 1994. In '94 and '95, together in those 2 years, we invested \$350,000 in pre-harvest food safety research.

In 1996, with a dissolution of the National Livestock and Meat Board, the post-harvest food safety responsibilities came to the National Pork Producers Council.

We added a food microbiologist, Dr. Margaret Hardin, and started a post-harvest research program.

In '96, we invested \$90,000 in post-harvest and \$180,000 in pre-harvest.

In 1997 and '98, we significantly increased our investment. Each of those years, we had \$300,000 in post-harvest research and \$500,000 in pre-harvest research. We are continuing to expand our emphasis on the food safety areas.

I would like to just expand on some comments from yesterday. There are some issues about which I have very strong views of what we need to be doing.

Yesterday, when I was showing the covers of all the different conference proceedings, workshops and reports that have been done, the point I was making is that we have a lot of lists.

We have very good lists. We have done a great job of generating lists.

We have not done a good job of figuring out how we are going to accomplish and make progress on those lists and prioritizing those lists.

I think it is important to understand as we look at all the different lists that groups have, we need to understand the context that they are provided in.

Some of the lists are put forward by regulatory agencies in areas that they see that they need answers before there can be or should be regulation in that area.

For commodity groups, we are generally looking at more short-term applied information, information that we can take out to the producers where we see some gaps in research, areas that are not being addressed that we feel should be addressed.

So there is a variety of approaches people have taken of putting together their lists, but I think somehow we need to come up with a national food safety research agenda, and I think we are seeing efforts to do that through the Joint Institute for Food Safety Research, and I hope that that group, as they move forward, that they do not look just at Federal research and Federal priorities, but they really look at trying to integrate research priorities.

I showed yesterday an example the cattlemen had used as a matrix to put research needs in certain categories and then list project under those, showing where they are making progress, where they are starting efforts, and where there are no efforts, and somehow, I think we need visual ways to communicate.

I think with Congress, when we go talk to Congress, we are continuing to seek more research dollars. We have to have some graphically visual way to show how those dollars are being allocated and how we are making progress and addressing the issues and where needs are that we are not able to address because adequate funds are not available across the private and public sector.

So I think somehow we have to get that coordinated, and that is not going to happen if we do not have a national food safety research database. I think it is a travesty that we cannot go one place, push a few buttons, put in some key words, and be able to find out what is being done in the public sector with Federal funds, as well as State funds that are being allocated for food safety research and some of the commodity groups and various other funding groups.

There is no place to go get that information, and when we are trying to find information on a specific area to see if we should put research dollars into it, you are trying to put a group together to sit down and discuss the issue. You really have to be networked to know who is doing what. I think we are missing some opportunities out there by not having a food safety database.

I know there are some efforts at the National Ag Library to accomplish this. I think it is going to be very important that this is a living, breathing type of list.

We really do not need just a list of the published reports. We need to know where there is ongoing research at the present time, research that has been funded, and we need a way to look up individual researchers, their affiliations, their project objectives that are being funded, the key

words.

I think that if we started establishing this, we could get some commonalities in how to put this database together. I think there would be a lot of incentives for different groups to participate in it.

I also would see this as an activity that the Alliance for Food Safety could take a look at, with 20 universities that all have databases. I think there must be some expertise in how to help put this together and get a coordinated approach from the universities as well.

I think I can't emphasize enough the need to have this if we are going to move forward on really making progress on food safety.

We also need, I think, to have some way, as I said, to record progress and research. I think at many of these meetings, if you do not stay in the loop on specific issues, you have difficulty in seeing what is different about the presentation from that researcher this year from last year or to be able to put it altogether and see that you actually are making progress in answering questions, that your research agenda does slightly change as you move forward based on answers you have gotten.

And I think we need to find a way--I talked yesterday about species-specific pathogen groups--getting the researchers themselves, the bench scientists together, to talk about their research. I think it is very beneficial in setting your next research agenda, and showing where you have made progress.

For us, one of the best exercises we had was sitting down and being able to cross things off the list, you have accomplished this, or in many cases, you get an answer that leads you to another research question that you need to ask as well, but somehow, we have to have a way to measure the progress.

I talked yesterday about demonstration projects, and I think this is an area for the Alliance--and I would also make some comments for ARS and CSREES. We really have to take these technologies out to the field and test them and be able to provide that information.

We have done this ourselves in our organization. Basic bench research stands up under peer review much easier than demonstration projects or on-farm field projects, which the previous speaker mentioned. This are very complicated, a lot of confounders, but this is the world we have to live in. Our animals are not in the laboratory. They are out with all these confounders, and we have to find a way for these technologies and interventions to be used and really produce a measurable difference at the farm level.

So I think for all the groups that fund research and the researchers themselves, we have to find more creative ways to actually get this accomplished, and I think through the Alliance, there would be some opportunities for cooperation there.

For many of these, when we have different types of production systems, we have to look at interventions in different production systems. We also have to look over season. A 2-month study does not tell us what is going on over the season, and geographic regions, does this technology and this information hold up over different geographic regions as well when you have

climatic conditions and other different factors at the farm level. So it is very important to have projects that look at those issues across broad geographic regions and over seasons of time.

Then I would emphasize again technology transfer. Research is not an end in itself, as was said yesterday. It is a tool to have us make progress.

We really need to start when we are looking at projects up front. We should be building in what the technology transfer mechanism is going to be.

I would say this. In our organization, and I think in some of the Federal research agencies, they look at technology transfer as getting a patent or producing a vaccine. That is part of technology transfer, but a very critical part is the information that is generated in research, and we have to find ways to get the information aspects out, even if they are not related to a specific product.

I think that is another area. As you look at the Alliance and the Joint Institute for Food Safety Research, think about technology transfer. It does us no good to fund research if we never get it out to the people that can actually use it.

Finally, I would just conclude that I think these types of conferences are very beneficial to start networking people together and develop strategies to move forward, but I think we have really failed in what we are doing if we just generate proceedings and reports from conferences and really do not move forward with actionable types of steps that really will make a difference.

I guess I am continually reminded when my phone rings, somewhat like Caroline, these are people on the front lines asking you questions. They are asking for answers.

I have producers call and say, "I just built a hoop building. Can you tell me what the food safety aspects or benefits or detriments are to putting in this hoop building? Somebody just told me that I won't be able to control this particular food pathogen if I have a hoop building. I am thinking of building another one. Should I do that or not?" Those are the kinds of questions we are being asked to come up with answers for, and they are really not interested in reading proceedings. They are interested in us coming up with the answers and finding a way to get that delivered to them.

Thank you.

[Applause.]

DR. DONNELLY: Our next set of comments will be delivered by Bennie Osburn from the Food Animal Production Medicine Consortium.

DR. OSBURN: Thank you. Thanks for the opportunity to comment.

I am Bennie Osburn, dean of the School of Veterinary Medicine at the University of California-Davis. Today, I am representing the Food Animal Production Medicine Consortium.

This consortium is composed of veterinary institutions at the University of California-Davis, University of Florida, University of Illinois-Urbana/ Champaign, Kansas State University, Michigan State University, and the University of Nebraska.

The consortium, founded in 1988, has had a record of food safety education and research, especially in the area of pre-harvest food safety. I suspect that some in the room have attended

food safety symposia and workshops sponsored by our consortium.

The Food Animal Production Medicine Consortium in association with Cornell University and Texas A&M University has over the past 3 years conducted assessments of the prevalence of Salmonella in culled dairy cows because meat from culled dairy cows is responsible for an estimated 18 percent of the Nation's ground beef.

The results of our investigations, now submitted for publication, conducted at culled cow slaughter facilities across the United States have been startling.

We have shown, among other things, that there was an overall prevalence of Salmonella in dairy cows of 23 percent. At some locations, depending upon the season, and summer in particular, greater than 50 percent of culled dairy cows slaughtered were carriers of Salmonella serovars. On a given day at a certain location, 90 out of 100 cows entering the slaughter facilities were Salmonella carriers.

We have thus far--and our data are still under analysis--measured a relatively low prevalence of Salmonella in feces from culled cows at the farm level, but a prevalence of Salmonella on the eventual hair coat at the farm that is in excess of 20 percent, and by the time the cattle enter the slaughter facilities, over 40 percent of the hides are contaminated by Salmonella.

The net effect is a 4-to-6-percent prevalence of Salmonella serovars on carcasses. These data strongly suggest the possibility that in-plant HACCP programs can be compromised and even jeopardized.

It is essential that research priorities for food safety include pre-harvest food safety research, specifically research that is directed at learning more about the on-farm ecology and epidemiology of relevant enteric foodborne pathogens.

Secondly, research dealing with cost-effective, easy-to-utilize interventions at the farm level that reduce the level of food-borne pathogens in and on animals to be shipped for slaughter is needed.

Third, research dealing with cost-effective, easy-to-utilize interventions at the processing plant that reduce the level of foodborne pathogens in and on animals.

And fourth, develop educational modules to deliver the information and technology to the producers, transporters, and processors.

Thank you for your attention.

[Applause.]

DR. DONNELLY: We have a slight change in our program. Mark Powell will not be making comments, and instead, we will invite Christopher Vanderpool from Michigan State University, Sociology.

DR. VANDERPOOL: This presentation is also for Craig Harris who is at the end of your list. His father got ill 2 hours before we were supposed to leave, and so I am doing parts of his and parts of mine, combining them.

Let me begin by, first of all, telling you about a parable. The first case of foodborne

pathogens was Adam and Eve, right? And so God says, "Adam, what did you do?" Adam says, "Well, I got it from Eve." So then Eve is attributing the blame to the snake. God looks at the snake, and the snake says, "Well, I got the guidelines from FDA. I didn't know there were regulations."

So what we see in that parable is the passing of the buck, which is very characteristic, and I am going to talk about human dimensions of food safety.

First of all, as we have been talking about these issues, what we see is that there is something changed about the structure and operation of the agri-food industry. One thing we see is the scale and scope of commodity structures have increased. We know very little about the sequential impacts of that growth of that scale.

We do not understand fully the primary change in food processing that most affect food safety and types and levels of risk at different points in food processing.

There are variations in common practices in small-, medium-, and large-size processors. Again, we do not study that, and we do not have a very good understanding of it.

We also pointed out that there is a problem with foreign agri-food labor on food safety, but we must remember, a large part of our produce, a large part of our farm labor is in fact migrant labor. A concern for migrant labor health may also be a concern for food safety.

There are differences in agri-food structures and practices in major foreign processing plants and fields, and that then leads to important questions of sovereignty.

Organic farming, as we are discovering, is no longer a source of safe food in terms of public perception in realities, and healthy foods are no longer safe, e.g., the case of alfalfa sprouts.

Next, please.

I would like to talk a little bit about public perceptions of food safety and risk, which is an opposite organization.

Risk perception creates new consumer activism and pressures for outreach and education programs. We do not know how consumer activism is created around food safety issues. We have the poster child syndrome in the Jack-in-the-Box case where all those children were infected in Washington, and then there is a rise of concern for food safety.

It seems the public waxes and wanes, and we need to understand how this can be sustained and what effect that is going to have on the food safety system.

Risk message research. There is the perception of threat, the vulnerability to threat, and threat severity and magnitude, and what we have seen in the case pointed out yesterday, if you had irradiated food right next to non-irradiated food, people will buy the irradiated food if it is cheap, and they lose their concern for any safety issues there.

So what does that say about threat perception, vulnerability of threat, or how people see the magnitude of the threat?

We also pointed out today the role of informational networks, the webs of news and reactions, but one of the critical things is the agenda-setting process. How does food safety become a social problem? When does it achieve a status as a public issue? When do

policy-makers see it as a public issue and an item of public action? Right now, it is a concern. Will it be so 10 years from now?

Another thing is that food and nutrition are social constructions. They are developed out of perceptions and understandings of the agri-food system.

We have little understanding of the accuracies of those social constructions. We do not understand how myths are developed, and how there are the persistence of myths and misunderstandings. Irradiation is unsafe. Organic is safe. If you go to Europe, bioengineered food is unsafe, and here, it is safe. So these are all important social constructions determining policy.

A next and very important issue is food safety justice issues. There are enormous differential food security issues among different groups in society.

Just go to an inner-city grocery store and compare it to your suburban grocery store, and look at the quality and variation of products in terms of meat and fruit and vegetables.

In addition, we have enormous cultural variations in the way we prepare food or the food that we want to eat, and now in the United States, we are entering into a phase where we are getting interested in exotic foods, exotic to us, but may be culturally preferred, but, again, the playing field is uneven there.

Risk perception alterations in food behavior; how does purchasing change? How does food preparation change, and how does eating behavior--this is a point on eating behavior.

Today, more people are eating outside the home than they do at home, and that is an enormous change, and it has enormous implications for food safety.

What is the effectiveness of recommended responses to avert food threat? Does the public really have the ability to perceive the threat and perform the responses that are required? Again, we know very little about it, and then finally, there are the issues of social conflicts generated by food safety problems.

If we go to the next sheet, some of those conflicts are consumers versus the agri-food industry, public versus governmental agencies, governmental agencies and the agri-food industry. Just notice the tension between the word "guideline" and "regulation," an enormous difference, and it leads to conflicts.

Now, if we put this into charges, we see a food safety system where research is sort of the jewel in the crown, and research has impact on policy, then has impacts on both education and regulation, but the key to make the system work is monitoring and surveillance.

Next slide.

Then we look at the agri-food system, and we see more complexity. We have inputs and labor into the production system. Production system leads to processors, which leads to distributors, and we can't forget there is transportation in between that. That impacts on consumers. Consumers then get concerned. It impacts on policy, back to research, and then we get another jewel of the crown, extension, where we are trying to transfer our knowledge to the public at large.

Finally, if we look at this interface, how we put those things together, we can see not only the general complexity of our agri-foot system, as I have talked about the growth of its large scaleness, but if we look at this, if we try to interface a food safety system and an agri-food system, there are key points of integration there.

Like, for example, education, research, regulation, policy, and all of that, we do not understand fully how those key points of integration work to make the food system safe in the United States.

Thank you.

[Applause.]

DR. DONNELLY: Our next presenter is Oscar Fletcher representing the Association of American Veterinary Medical Colleges.

DR. FLETCHER: Thank you very much.

Good morning. I am Oscar Fletcher, Dean of the College of Veterinary Medicine at NC State University, and I am here representing the Association of American Veterinary Medical Colleges, herein after referred to as the AAVMC, and the NASULGC Board on Veterinary Medicine. I am past president of the AAVMC and the current chair of the Board on Veterinary Medicine.

The Association of American Veterinary Medical Colleges coordinates the affairs of 27 U.S. veterinary colleges, four Canadian Colleges of Veterinary Medicine, Departments of Veterinary Science and Comparative Medicine, and the Animal Medical Centers.

The Board on Veterinary Medicine is a component of the Commission on Food, Agriculture and Renewable Resources within the National Association of State Universities and Land Grant Colleges.

And 25 of the 27 U.S. Colleges of Veterinary Medicine are located on the campuses of land grant institutions and members of NASULGC.

Heads of Department of Veterinary Science, Comparative Medicine, or Pathobiology in NASULGC member institutions are also members of the Board on Veterinary Medicine.

We want to thank the Secretary of Agriculture, the Cooperative State Research Education Extension Service, and the Agriculture Research Service on behalf of both of these organizations for giving me the opportunity to talk briefly about priorities in agricultural research.

Food safety is an obvious issue of paramount importance. All of us are stockholders. In many cases, food safety concerns are traced to improper handling by a consumer, but we can and should do more to assist farmers- and ranchers-produced food that minimizes foodborne illnesses at the consumer level.

We need a body of knowledge from applied on-farm research that will prepare producers, extension specialists, and veterinarians to be better applied practitioners of food safety for on-farm interventions.

So one of my themes is infrastructure and personnel, and that is we need practitioners for applied on-farm interventions, and I would make a comment here based on what I heard this

morning. All veterinarians, regardless of whether or not they are involved in food animal production are sources or potential sources of information to consumers. About 80 percent of our graduates go into private practice, and about 80 percent of those graduates are involved in companion animal medicine, but they interface with consumers on a daily basis and they are in a position to explain when the question arises what is Mad Cow Disease, et cetera, et cetera.

A major theme in our opinion that should be considered in a discussion of food safety is the development of integrated solutions. That might also help eliminate problems of air and water quality. Now, integrated solutions come from multidisciplinary research, and I would emphasize veterinary medicine, animal science, and environmental science.

It is essential to include also species-specific issues that allow a focus on the uniqueness of production and pathogens to that individual species.

I will come back to this again in just a minute.

I want to mention three areas of emphasis or focus on behalf of AAVMC and the Board on Veterinary Medicine. First is an initiative that we would suggest calling animal health and the health of humans. The focus is the production of healthy animals.

We think it requires a new programmatic effort developed that would be focused on securing the production of healthy animals for a healthy food supply.

A sustained effort focused on applied solutions to on-farm contributions of foodborne risk is essential.

Applied solutions require a knowledge base and a cadre of trained professionals to work with animal producers.

We believe that continuous funding at the national level is indicated in order to establish and maintain programs throughout the United States that are focused on food safety research, professional training, and the provision of service to animal agricultural and food safety issues. Such funding provides the infrastructure required for elimination of foodborne illnesses.

The Nation needs a cadre of investigators housed throughout the U.S. university system and engaged in research, education and transfer of knowledge about emerging food safety and public health problems.

The information derived from a newly focused animal health to healthy human research effort would provide a foundation of knowledge. Funding needs to be in place to support new training programs at both graduate levels so that adequate numbers of people with backgrounds working with HACCP and ISO-9000 standards, phytosanitary standards and quality assurance programs are in place to fulfill a growing need.

The fundamental knowledge, as well as the programs creating experts in food safety intervention methodologies are in high demand and sorely needed. The creation of a new animal health initiative in the form of ongoing national core funding is also warranted considering the global marketplace.

By increasing our focus on food safety in our ecologies of vendor and medicine, there will be a growth and comprehensive understanding of the ecology of infectious agents at the live

animal stage in the farm environment.

Pathogens such as Salmonella and E. coli 0157 that pose serious hazards to human health through contamination of food stocks, will become better understood at the ecosystem level.

Veterinarians and other food safety experts knowledge base will increase with the new understanding resulting in new and improved interventions.

Now, another important goal of animal health to healthy humans is protection of the U.S. export markets. Recognition of the reality of global sanitary and phytosanitary standards and how they can and will become legitimate concerns or clever non-tariff trade barriers behooves us to prepare a professional class dedicated to understanding and working through these types of food safety problems.

The AAVMC and the Board on Veterinary Medicine have recommended in the past that this new initiative should be established with the addition of \$5 million in new funding awarded to Section 1433 which is a continuing animal health and disease research program.

We would like to see yearly increases over a three year period to sustain a \$15 million increase. Section 1434 is another possible source of funding for this type of program. But where such a program is funded is less important than recognizing the need for funding that establishes and maintains a specialized pre-harvest research and training effort throughout the 50 States.

Right now Section 1433, the animal health and disease section, is funded at about \$5 million. \$5 million represents 4/10ths of 1 percent of the on-farm cash receipts in North Carolina alone.

Now, I realize there are other sources of food safety funding which, I think, points out another dilemma; and that is, how does one pull together what these various sources are and how does an investigator or a person interested in these areas know where to go to find those sources of funding if they're scattered through multiple budget lines and potentially multiple agencies at the federal level.

The need for funding that recognizes and maintains a specialized pre-harvest research and training throughout the 50 States; I would emphasize that again. New guidelines would be necessary outlining the specifics for those universities and specific colleges that want to develop such a food safety program and thus be eligible for funding.

The second recommended area of research focus that I want to mention is the development of on-farm pre-harvest food safety systems for each of the six major product commodities, including eggs, poultry, dairy, beef, aquaculture, and swine. Now, this initiative, we recommend, could be funded through increases in the National Research Initiative, the NRI.

Again, where it's funded is probably not as important as the mind set that says we are going to devote a pool of funds to this particular project, and not dilute it with other efforts. In order to be effective, the funding stream should be committed with a long term view and on a sustaining basis.

It appears logical, considering the problems that need to be better understood and the priority areas within the NRI, that new funding or a reallocation of existing funds come to two mission areas, animal systems and natural resources and the environment.

The NRI is a logical delivery system for just such research, because it is competitive and because it's nationwide. Promoting species specific pre-harvest food safety research through a funding mechanism such as the NRI capitalizes on the diversity of disciplines necessary to solve the modern pre-harvest food safety problem.

This focusing on specific species centralized under a competitive based funding stream would allow for needed flexibility and crafting solutions as one faces complex food safety problems at the live animal level.

Now, we think that such an emphasis in the NRI should begin by dedicating at least \$2 million for work in each described animal commodity area, that's \$6 million. Collaborative studies need to be carried out with a variety of experts and discipline studying on-farm systems to develop strategies for understanding the ecology of pathogens and avoiding contamination of animals and animal products before they leave the farm gate.

Information gained in the study of microbial ecology will assist in the development of HACCP procedures or other on-farm intervention procedures, quality assurance programs that result in risk identification and assessment, and finally risk management of pathogens in each commodity area.

This type of collaborative research that encompasses multi-disciplinary approaches to problem solving increasingly is necessary. It is important to realize the problem-solving capability that can be derived from integrated biological approaches.

Funds are needed to support ecosystem studies by veterinarians, animal scientists, and environmental scientists. Development of sustainable systems for intensive food animal production that result in minimal impact on the quality of air and water and result in a safe food supply are the goal.

And then lastly, we believe there is a need to determine the food safety impact of various production management strategies so that sustainable practices with the lowest possible risk will be widely used. Research is needed that fairly evaluates various production techniques for effects on human health, such as animal feeding of low level antimicrobial drugs and the development of antimicrobial resistance or the use of various feed stuffs or other techniques that minimize human pathogens present within livestock prior to slaughter.

Additional evaluations into herd medicine or population medicine that integrate the science of epidemiology, an environmental perspective, and production techniques will go far toward the development of important and useable new knowledge.

Research that may elucidate the need for cultural and management modifications to traditional animal production systems will potentially be more widely accepted if publicly funded on a national level. Therefore, another focus that we feel should be considered is the creation of a program within the arena of food safety research dedicated to evaluating various production techniques for their potential food safety impact. This type of non-biased information will be quite valuable for animal agricultural producers.

A different yet related subject to research in the comparative production methodology is

the success of genomic studies in micro organisms. We encourage and support research into genomics. We do want to emphasize that genomic research into microbial organisms is important. And sometimes our microbial friends get left out in consideration of genomic science with a focus on the human genome or the genome of animals.

By undertaking and supporting genomic studies, we will be able to serve food safety needs by rapid identification of microbes through molecular finger printing. The development of molecular finger printing strategies for microbe identification would be an essential element to management systems for livestock and natural resources in the environment.

This type of knowledge is paramount if pathogenic organisms are to be controlled or even eliminated in the food supply.

I want to thank you for giving the AAVMC and the Board on Veterinary Medicine this opportunity to discuss food safety research needs. I hope our comments will be helpful in prioritizing food safety research initiatives within the USDA. Thank you.

[Applause.]

DR. DONNELLY: The next presenter is Kevin Keener from North Carolina State University.

DR. KEENER: We'll see how I can do up here. I got about 44 overheads and 10 minutes. So we'll have to go pretty quick here.

I think I'm going to stand back here so I can kind of see things as I go along.

I'm going to talk more about some research that we're actually doing now to a particular application on particular cryogenic in shell eggs. This afternoon, Melissa Taylor is going to be talking to you about some of the work we're doing in regards to food safety training, and some things like that.

But specifically, we had a field trial that we did with a commercial system for cryogenic cooling of shell eggs. My name is Kevin Keener, Department of Food Science, North Carolina State University.

I want to acknowledge the contributing researchers to this, Dr. Ken Anderson, Dr. Pat Curtis, Rhonda Hughes at Auburn University, and Dr. Frank Young, formerly at N.C. State, now at the University of Arkansas.

What I'm going to talk a little bit about is the background, a little bit about the objectives of the project, the methods and materials, results, discussion, conclusion, some impacts, and then the acknowledgements.

As you've been here the last day and-a-half, you've already heard about Salmonella enteritidis in regards to shell eggs and shell eggs processing. There's a significant concern there.

U.S. egg processing, if you're not familiar with that, I'll try to give you an interview of what happens during that process. But essentially, the chicken lays the egg, it goes into a facility, it's washed with a spray type wash system, typically hot water, it goes underneath some intense lights, and it's candled. It's weighed on a scale, sorted, graded, put in the cartons. The cartons are packed up, typically in cases. You're talking about the little styrofoam type cartons. You put

30 dozen in a case. A case is just a box, cardboard box. These are all stacked on a pallet. And then those pallets are put into a large refrigerated area to cool. And they're shipped out to distribution.

Essentially in that process what we've found is looking at that process is those eggs that are put into that center carton take 7 to 10 days to cool down from about 100 degrees fahrenheit, 110 degrees fahrenheit to 45 degrees fahrenheit. So if you think 7 to 10 days in regards to the process, significant amount of changes can occur during that time. And so that's what we're kind of looking at.

So, anyhow, there are significant problems there. So the question came up, how fast do eggs cool?

Well, what we looked at was cryogenic cooling, we could cool eggs very quickly. So what we looked at, we had five objectives in this study, to determine the feasibility of cryogenic cooling, to rapidly cool shell eggs processed in a commercial facility, determine the rate of cooling for this process--go to the next one, please--determine the effect of cryogenic cooling on microbial populations in particular with the-- and then determine the effect of cryogenic cooling on egg quality, yolk membranes.

I want to mention there are three--well, also, it's a sweating process. There's a concern or a question that's come up in the past in regards to sweating eggs, where you take cold eggs and you put them out at warm temperatures, and you will get water condensation on the sides, and so on and so forth, and whether that has an effect on microbial populations or the growth of microbes. And the fifth objective was to determine the effect of cryogenic cooling on egg quality over an extended storage period.

Next one, please.

So we didn't go out there with just a few dozen eggs. We actually went to a commercial processing facility. We leased a facility. We went out and we processed eggs, as anybody else that processes eggs would do.

The study, itself, involved about 108,000 eggs. We evaluated these for shell structure, content quality, bacterial content, the effect of sweating. We had 20 total treatment groups. And this would be, a treatment group would consist of 5,400 eggs. And so you could think of that in the morning, for example--and I'll get into this a little bit in regards to that--but there's 5,400 eggs per cooling treatment, as reported--repeated in the morning and the afternoon.

So in regards to the system that we used, we had gaseous nitrogen that we're looking at, the cooler itself is about -90° C, liquid nitrogen about -120, gaseous carbon dioxide was about -60. Traditional cooling with the method I just told you in regards to packing eggs up, putting them in the cooler, letting them cool about 7 to 10 days.

The cooling curve, we evaluated the cooling rate for these different ones and we did our egg quality measurements, and then our study on sweating. So this is just a typical curve for the egg itself, after it was cool, came out of the cooler, it was then--the temperature probe was inserted into that, and it was put into the storage area. And you can see that the internal egg

temperature that was cooled as it went through this cooling system with the gaseous action, cooled down very quickly, and it was about 47 degrees. The case temperature was the internal temperature inside of that case. And you can see that the air inside of there was also about the same temperature when it's been in the cooler.

Liquid nitrogen, the liquid nitrogen process was actually putting the nitrogen, itself, directly onto the egg surface. In this case there were some issues with the equipment that we used, and I'll talk about those a little bit later. But there was the--it was not able to precisely control the equipment. And that was part of the issue with some of the equipment. And I'll explain that a little bit later.

But you can see here that there was an initial drop in temperature in regards to the case temperature when you put that case into the cooler. The egg temperature dropped also upon applying this liquid nitrogen. But it wasn't as fast as what you had for the gaseous nitrogen. The issue there was the amount--the ability to control how much was put onto the eggs, because you didn't want cracking, and things like that to occur.

And then the traditional method, this would be what I just indicated previously. And you can see here that it takes--in this 140 hours there, a little bit more, you know, up to 240 hours, which would be 10 days, so something in that range from 7 to 10 days there in regards to cooling down to the refrigerated temperature.

These are the results here for the first study. The GN is gaseous nitrogen. LN is liquid nitrogen. TC would be traditional cooling. The statistics and the P values that are at the bottom, I'll kind of just emphasize some important point. Haugh units is typically how eggs are graded. And the grading on that is based upon the amount--the height of the albumen or the layer on top of the yolk. So if you break an egg out, and you measure that height that relates to what's called a Haugh unit. And the higher that is, the higher the quality of the egg. If it's above a value of 72, that would be considered a AA grade egg. If it's below that, it would be considered a A grade egg. What we saw here was with the gaseous nitrogen, it showed a little bit of improvement in regards to Haugh units.

The checks would correspond to the number of eggs that were cracked in the system. If you notice, it's a lot higher with the gaseous nitrogen. The reason for that is the equipment that we had, the company that we were working with, had no experience with eggs. And so their thought was they could take a system they used for flash freezing or quickly freezing, like, fish filets, and you run eggs through it.

Well, you know, you think about taking eggs and putting them through something like an apple sorter. I mean, what are you going to end up with at the end? And so there's a lot of issues with equipment design that weren't done initially. But with the limitations in regards to cost, and things like that, we pretty much had to use the system that was available. And so that's something that in regards to high checks loss, the design of the system could be improved. And currently it's being redeveloped, a system is being specifically designed for shell eggs. And our plans are to do a field test on that here within the next couple of months.

The losses that are there, you can see a little bit higher losses also. Losses refer to, in the egg itself, when you crack it out, you want an intact yolk. And typically if you have what's called a stuck yolk, when you crack it out, your yolk will break. And you may have had that happen.

What we've seen, and still some research that we're doing, but the high percentage of the gaseous nitrogen because of the very cold temperatures and the limited area of contact of that gas on the cooling the eggs, we suspect that because there is a large thermograde that's generated there, that for some reason the yolks seem to be more attracted to the edges of the shell than staying centrally located. So when you cracked it out, you had more problems with that.

Vitelline membrane is the membrane that covers the yolk, itself. You see it was a stronger, or a little bit stronger membrane for the gaseous cooled, and the elasticity referred to the deformation. Both of those qualities probably just relate to the fact that you cooled this egg down quickly. And so you didn't have that 7 to 10 days of elevated temperatures. So we did see some quality improvements there.

This is just typically over time here, the dark line in the middle would be the grade A, AA is the lighter one. You can see the values over each one of the different weeks in the storage period when we sampled those. And those are actually graded by USDA egg graders. So this wasn't something that we did. This was actually we had people come in that were experts in that.

Can we go to the next one, please?

And this, this shows the breaking force. It relates--there is some trend similar to what you saw with the values for the Haugh units which relate to quality. The strength goes down as a function of time, storage time.

So if we summarize those, the times that are required, that was also an indication of equipment. You could design the equipment to cool the eggs down in the order of a few minutes, significant differences in the quality among the different treatments, declining Haugh units over time.

The next thing we're going to look at is the carbon dioxide cooling here. In this case also, there is an issue with the system. They took the same system that had nitrogen, and they had to put different nozzles in there. So we had issues with the eggs actually being blown out of the carton. And obviously that would cause some problems. So we had to adjust the system.

And so what you see here is the cooling curve. You had this cooling curve that dropped down initially for about 100 degrees fahrenheit, or something like that, to around 55. You could design a system that could cool these eggs very quickly, in the order of a minute, or something like that, in this environment, without this issue. But because of the equipment limitations, the cooling curve that you have there shows that it takes, in regards to the cooling, about 100 hours for both of these to equilibrate. And that was more the equipment in the laboratory. We've seen that we can get those down very quickly, on the order of about 5 to 10 minutes.

So this is just a traditional one here. You can see it takes the same amount of time for the those.

We had an interesting result that came out of this. Periods here would correspond to

days. So we were down there on two different days. Period one we had eggs. This facility is actually processing all the time. And we had two separate buildings. So we were in one of the buildings where we set up our equipment and facilities.

Period one was eggs that came from some older hens, I guess. Period two was from some younger hens. The interesting thing here, if you look at Haugh units, which relate to quality, the gaseous carbon dioxide cooled eggs, the Haugh units on those increased significantly. It went from a grade A to a grade AA when we had these older hens that were laying the eggs.

The period two here would be high quality eggs from young chickens. And there was a slight increase in regards to those also. But that's something that came up and was very interesting.

This just shows the AA versus the A grade for period one there. And you can see that the grade was maintained pretty much over the 8 week storage life. So it seemed to maintain that quality after the treatment.

The period two here, what we have is, these were the young hens, I guess, laying the eggs here. So you saw some variation. And there is what they're called week interactions, treatment by week interactions which means the difference between the carbon dioxide and traditional varied. And that had to do with the sampling, you know, the number of samples that you could take each week. We were on the order of 260 eggs was a sample, but if you think about it, you know, 1,000 eggs or 100,000 eggs, or what ever, that would vary significantly.

If you look at the percentages of the checks, in this case, the cracks in the eggs, there was a little bit higher percentage for the gaseous cooled. The losses were similar. Membrane strength was a little bit higher for the gaseous carbon dioxide cooled here also. The checks loss here, also in regards to redesigning the equipment, we could significantly reduce that difference.

We started looking at microbial information. This would be for the Salmonella. When we did our treatments, the bottom line here, nitrogen gas cooling, the interesting thing is if we look at the--this would be naturally contaminated eggs, so the values are very low here--but the interesting thing is you don't see an exponential increase after about 4 to 5 weeks in the nitrogen gas cooling. So that's very significant, and we don't know exactly why that is.

If we look at the sweating, the issue of sweating, we pulled samples out with the sweating versus non-sweating, and what we saw is there's no statistical difference in regards to eggs that are sweated versus non-sweated traditionally cooled, nitrogen cooled, or CO2 cooled.

What we can see here is in regards to cracked. If you had cracked shells, obviously you get greater increase in regards to the number of micro-organisms that are present there. One of the interesting things is the nitrogen gas seemed to significantly reduce that even in the cracked shell egg.

When we look at the microbial counts for the carbon dioxide eggs, we see also we really don't see the same trend as the traditionally cooled eggs during that time period.

The similar results here shown for the intact versus cracked shell is the carbon dioxide. Let's move onto the sweating. There was no differences, as indicated.

So if we go back to the objectives, the first objective in regards to the feasibility of using cryogenic cooling and rapidly cool shell eggs, both nitrogen and carbon dioxide have been shown to be commercially feasible to cool the shell eggs. Nitrogen needs considerably more research. Carbon dioxide offered more benefits in addition to that in cooling--the rate of cooling showed to be able to rapidly cool the shell eggs. Design of the system, we could improve upon that time frame.

On the microbial levels, all were the same for the sweated versus non-sweated.

The vitelline membrane strength was stronger in the eggs that were cryogenically cooled.

And the use of this technology, we saw an overall increase in Haugh units, and the cryogenically cooled eggs maintained their AA quality at least one week longer.

So with that, I'd like to say thank you. And I'll be around later if you have any questions.

[Applause.]

DR. DONNELLY: Our next presenter is Brian Hyps from the American Association of Plant Physiologists.

DR. HYPs: Thank you for the opportunity to provide comments today. These comments were developed by a number of ASPP members led by ASPP President Brian Larkins, Professor at the University of Arizona and past editor of The Plant Cell.

Founded in 1924 the ASPP, the American Society of Plant Physiologists, represents some 5,000 scientists conducting research in many specialty areas of plant science. These plant research findings are published by ASPP each month in the peer review plant science journals, Plant Physiology, and The Plant Cell.

We commend the department for holding this conference to identify the gaps in the knowledge base of safe food production, processing, handling, storage, and preparation. Our comments will focus on plant research that should contribute to safe food production.

Food safety research should include an emphasis on mycotoxins. The Department of Agriculture and a number of land grant universities have conducted research on mycotoxins. Mycotoxins present a series of difficult problems that still exist for peanuts, corn, cotton seed, and other plants.

As former NRI chief scientist and ARS scientist, R. James Cook of Washington State University explains, research is needed on molecular biology and genetics of mycotoxin production and on the role of plant stress, especially plant water stress in mycotoxin production. The science currently in place on the role of plant water status and mycotoxin production is weak, Dr. Cook noted. He called for an enhanced research investment that will lead to more effective approaches in solving this important food safety problem.

One approach undertaken at Mississippi State University has been on the development of several maize inbred lines that are resistant to *Aspergillus flavus* infection and associated aflatoxin production. Researchers there will use this germ plasm to look for genes that may contribute to *Aspergillus flavus* resistance.

As you know, one class of mycotoxins that are a particular problem in peanuts, corn, and

cotton seed are aflatoxins. Other mycotoxins that warrant further research are fumonisins, also in corn, and deoxynivalenol in wheat and barley. As the Agriculture Research Service notes in its national program statement on food safety, further understanding is needed on the biology of plant fungus interactions and toxin production.

Dr. Mark Cohn, Professor of seed biology at Louisiana State University and editor of the Peer Review Plant Science Journal, Seed Science Research, notes that more knowledge is needed on the mechanisms of seed, seedling resistance to pathogens. For example, without chemical seed treatments, rice seeds and seedlings are highly susceptible to pathogen attack.

However, in red rice, which is a relative of rice, both the seed and seedlings show natural resistance to pathogenic fungi infection. Common soil pathogen fungi grow over and around the red rice seeds without invading the seeds. Further study of red rice seeds may help to identify resistance traits that might be transferred to seeds of other varieties of rice. Knowledge gained from this research also holds promise for other varieties of crop plants.

A danger to millions of people here and abroad is the existence of allergens in many foods. Plant research by Bob Buchanan of the University of California, Berkeley, offers the prospect of using biotechnology to remove the allergens from foods to make them safer for human consumption.

Many potentially allergenic proteins in food contain sulfur to sulfur disulfide bonds. For example, they're found in wheat, milk, soy, peanuts, and eggs. Dr. Buchanan took advantage of knowledge of the unique ability of thioredoxin to break sulfur to sulfur bonds of seed and chloroplast proteins, and reasoned that in this manner thioredoxin might also neutralize allergens in foods.

In experiments carried out with his collaborator, Dr. O.L. Frick, University of California, San Francisco School of Medicine, Buchanan found this to be the case first for wheat, and more recently for milk. The experiments that have so far been carried out are with dogs sensitized to the food of interest. This and ongoing research has demonstrated that the dog is an excellent model for human food allergies. Buchanan would like to extend his research to humans.

Thioredoxin acts on allergen proteins in two ways. First, by changing their shape, thereby lowering their recognition by the immune system. And second, by dramatically enhancing their digestibility. By eliciting these changes, thioredoxin alleviates the well known gastrointestinal responses caused by the allergen.

Dr. Buchanan explained that most allergic dogs were able to manage the major allergen of milk without ill effects. Similar findings were made with wheat.

Dr. Buchanan believes that in addition to alleviating the allergenicity of a variety of foods, treatment by thioredoxin could yield healthier, more digestible foods for non-allergy sufferers, especially those with digestive problems.

This is an area of research where future support by the Department of Agriculture could result in safer foods for millions of food allergy sufferers worldwide and relief of food digestibility problems for millions more. Enhanced research efforts into this new and ground breaking

approach of making food safer by removing allergens from foods could be expected to result in a reduction in the number of food allergy related deaths and illnesses.

Dr. Buchanan notes that the Department of Agriculture has been a great help, but due to budgetary constraints was unable to meet many of the research needs. As a consequence Buchanan's ability to develop his research beyond the most fundamental stages has been quite difficult. Enhanced USDA support would result in advances in this area by facilitating the movement of a researcher, such as Buchanan, into research more directly related to the mission of food safety.

In another important area, plant biology research aimed at enhancing the natural defenses of food plants against pests reduces the dependency of farmers on pesticides and contributes to food safety. Research that leads to plants with enhanced natural defenses contributes to management of pests and diseases of fruits and vegetables during production, during shipping, and during storage.

There are many examples in addition to these highlighted earlier in this statement where plant research impacts directly on food safety produced and safety concerns. For example, some food crop species have a biosynthetic capacity to produce hazardous levels of chemicals such as cyanogens, toxic alkaloids and oxalates. In some cases, their biosynthesis is induced by environmental influences under the control of poorly understood regulatory pathways.

We appreciate that the Department of Agriculture, through this conference, is offering the opportunity for the research community and other interested groups to share their views on effective approaches to food safety research. Again, we commend the department for holding this conference.

[Applause.]

DR. DONNELLY: And the final commentary will be provided by Peter Cowen from USDA FSIS who is replacing Mark Powell.

DR. COWEN: I know it's just before lunch, and Mark wasn't here. So I'll try and make this brief.

What I'd like to do, and what I'm sure what Mark would have liked to do if he was here, was make a request for data. But before I go into the specific kinds of data that I would like to receive from the group at large here, let me just make a comment as to why the data are so critical, and I think several speakers have touched on this over the course of the conference.

Clearly, risk assessment, which is what I'm engaged in as a member of the E. coli 0157 risk assessment team, and Tanya Roberts is in the audience and has spoken, is also a member of that team. Risk is at the interface between research, which is what this conference is about, and the setting of policy. And it's critically dependent, and several people have mentioned this yesterday. In Roberta Morales' presentation, she mentioned the critical need for partnerships in terms of assembling the data that are required to do an effective risk assessment. Beth Lautner foreshadowed the same kind of thing.

And certainly the National Alliance for Food Safety is a movement in that direction in

terms of developing all the data required in order to do an effective risk assessment.

In terms of the E. coli 0157 risk assessment, which is the second effort out of the Office of Public Health and Science and Food Safety Inspection Service, the first one being the Salmonella enteritidis risk assessment, we're past the start up date. And risk assessment is a highly organizing effort. And it is critically data dependent.

And we're in the phase of getting organized. So we're past the start up phase. We're in the beginning phase. And, in fact, we have issued a summary of the data that we have at hand, had a public meeting on October 25th. And the results of that meeting are up on the web site for FSIS.

Anybody who has any data that would be relevant to the E. coli 0157 risk assessment, we would very much appreciate them putting it into the public document.

The kinds of things that we need--and you can see this on the web site as to what we have and what we don't have--the prevalence of on-farm E. coli 0157:H7, both in the guts of animals and also on hides. We need any information on the effect of transport to the slaughter house.

In the slaughter house, and that's something that Tanya has gathered quite a bit of data already, particularly with the help of John Sofos and several other cooperators, but we really need any good industry data.

And I understand and appreciate the problem of releasing such data and putting it into the public document, but the risk assessment and the resulting policy will only be as good as the data that we have to put into the risk assessment.

So anywhere along the line in terms of any of the steps, like for example, de-hiding or what might happen in terms of, particularly, carcass decontamination and recontamination steps would be extremely critical.

There are also big data gaps in terms of processing and preparation. And then finally, another critical area, and this is one that happens in all risk assessment for human pathogens, is we need more and better data on response in terms of what happens at different levels of human infection and what is the resulting occurrence of illness.

So anybody who could provide any data, we can use it up until January 8th. After January 8th, I'm not saying we won't be able to use it, but January 8th is the date that we have fixed firm for moving forward with our risk assessment.

And once again, I think the important thing to understand here is if we don't have data, the risk assessment will deal more with uncertainty. And risk assessments are set up to do that. So it's not as if the risk assessment can't move forward.

But however, if we can get more data, we move into the area of modeling variability rather than uncertainty. And given the amount of food safety problems that we've heard discussed at this meeting, this is the next major effort to move forward in terms of a food-borne pathogen.

So I hope everybody would use this as an instance to cooperate, to share data, and provide us members of the E. coli 0157 risk assessment team the material to work with. Thank you very much for your indulgence.

[Applause.]

DR. DONNELLY: We'll thank all of our presenters for their important participation in the public comment portion, and I'll turn this over to Bill.

DR. WAGNER: Thank you, Catherine.

A very brief announcement. I'm going to immediately go out and put out on the table for you the Federal Register announcement dated today, November 13th, with regard to a public hearing on the proposed joint institute for food safety research. This is an activity which was put in motion by the presidential directive of July the 4th, 1998.

The public hearing is scheduled to be December the 1st, 1998, from 8:30 in the morning till 3:00 p.m. in the afternoon in 107A, the Jamie Whitten Building, U.S. Department of Agriculture. All of the necessary information in terms of making contact with Sara Poythress who is compiling the agenda for that public hearing. I will put this announcement copy out on the table for you to pick up as you go out.

Thank you.

Be back here at 1:15.

[The conference adjourned for lunch at 12:01 p.m.]

AFTERNOON SESSION

[1:22 p.m.]

DR. KNIPLING: Good afternoon, ladies and gentlemen. I see our ranks have dwindled a little bit. We have the hard core group here.

We're going to continue this afternoon with the public comment period. I'm sure that some others will filter in, but I do want to get started right on time so that we can also end according to schedule.

My name is Ed Knipling. I'm with the Agriculture Research Service, and I'll be moderating this session this afternoon. And we're going to continue the public comment period from what we had this morning, very much in the same format and vein.

And we have a published schedule of persons that have requested to speak. I believe most of you have that. Actually, there are some adjustments to this. I think we have three, three that are no longer going to be with us this afternoon, but we have several others. I think there's probably a net, a net reduction of one on this list. And if there are other comments, time permitting, we'll squeeze those in. But I think we'll try to stick to our public schedule of ending this part of the program right at 3:00 o'clock so that we can have the wrap-up thereafter.

So without any further introductory comments on my part, I'm going to call upon Melissa Taylor from North Carolina State University.

Melissa, you were somewhat introduced earlier this morning, and you have a continuation of some of that story from North Carolina State.

MS. TAYLOR: Thank you.

I'd like to introduce myself. I am Melissa Taylor. I work with the North Carolina Collective Extension Service at N.C. State University. I have quite a unique position. I am a food safety education and communications specialist, long title there. I started my position in January. And some of the things that I'm responsible for are technology transfer, information dissemination, especially through the use of distance education, agent specialist interaction, which is crucial, employee training in industry and in food service, and overall I guess you could say food safety awareness and education.

And I wanted to talk about some of the programs that we're doing at N.C. State. The postcards and stickers that you might have seen on your way in or out, that was a project that I worked on, a food safety data base that has been extremely successful. It is for our county agents so that they can receive food safety information without having to call us as specialists.

People all over the world use the Web site. I link to numerous other data bases. And I see it as a way to bring the general public to all that's out there about food safety information, kind of one stop shopping.

We also have worked very hard with agent-specialist interaction. I briefly mentioned earlier when I was commenting about the importance of the Cooperative Extension Service, we saw a need within our state. Our county agents have very different backgrounds, different educational levels. So we just completed a two-year training project. And we selected 12 of our

family and consumer science educators. They have different abbreviations and names, but basically are county agents that work with food nutrition.

And these 12 agents have had intense training. We gave them a three week course for which they received graduate credit. We've also had workshops throughout the year. They've done special projects and group projects. And it's really given them a greater confidence to deal with food safety questions.

These are the agents that we are seeing go back into their counties and want to develop new programs and new resource materials. These are the agents that now realize that FDA and USDA are here for them, and they'll pick up the phone. They're now getting information sent to them. So it's really, really a great thing, because these are the people that are talking to our consumers on the telephone after a news story about a particular food commodity. These are the people that can really make an impact on consumer opinions.

We also have done a great deal of employee training. We work with the industry in North Carolina. We have a lot of red meat and poultry processing plants. We've done a lot with HACCP implementation. We see in the future this is going to continue to increase. We have a lot of small and medium size processing plants.

And from what I've been told with other specialists in our department, this is going to be a real challenge, because these plants are so small that they can't just send a few people to a workshop that N.C. State's offering or that, you know, we're having somewhere else. The whole plant will have to shut down. And I do remember that it has been mentioned over the last day or two that this is a priority.

We also do food service training. We use the Serve Safe program. Our county agents are going and offering the programs within their counties. They're partnering with the health departments and the health inspectors. So we're building these great relationships.

And some of my thoughts that I've been jotting down over the last two days, I just want to say that from a research perspective, you can greatly improve your research when you get feedback from the farmers and industry. Because this important relationship which you probably already, you know, are aware of, it lets you know the challenges that the producers and the processors, and ultimately the food handlers do face.

And like most of you, I get very upset when people don't explain what we all as a group have been doing in food safety. And we need consumer education. They have numerous questions about the increased incidence of recalls and the number of outbreaks.

We must explain that the better detection methods that we have, the increased awareness on both sides, and even the mandatory testing in the plants, that these are the reason that they are seeing more food safety issues come to light. And as we clean up and get safer, it will continue to appear possibly to consumers that we're dirtier. So, I mean, that's a challenge that I think we face. We have to explain to them that we've been clean. We're just bringing more to the surface and digging deeper in.

I think we need to educate everyone, you know, farm to table. And today I was sitting

here listening about the transportation. You know, we need to educate the truck drivers to why it's important to what they're carrying. Whether your company outsources or uses trucking internally, the truck drivers need to know the importance during transport to the receiver, be it the supermarket or the restaurant.

I've been on the other end. I've seen the way shipments arrive in 100 degree weather and they get left on the back. And this is perishable raw seafood that we're going to cook. I mean, I've seen it. I've been there.

Consumers, they need to understand they need to go straight home. The consumers probably don't realize the way a grocery store is designed. The reason your meat and your dairy products are where they are. You know, it's designed, we all should know, it's designed so that you get your products and your perishable products are what you receive last. And you go straight home. You don't go to soccer practice. You don't go to the bank. You go straight home. So I think if we can explain this to consumers, then that will be a great thing for us to do.

Another area, I think physicians need to be informed and involved. The media should not be the educator for doctors. How can we get them involved with our mission? That's a question I have for you and for everyone else.

I also think we need to take advantage of the consumer's attention. We could use recalls and outbreaks as a time to educate. This way we can be proactive during a reactive time, and at least something good would come out of it.

David Schmidt, from International Food Information Council, mentioned that 80 percent of disease is as a result of food handling. Then we need more money for this type of education. I can't think of any better way to say that. So I reiterate his opinions about handling.

And yesterday, Dr. Woteki asked some questions. She had six concerns. The ones that stuck out in my mind were the third concern about are we meeting the needs of the small processor, and the fifth concern, are we funding programs for consumer education and motivation? We should be.

So my needs are obviously, money, money, money for consumer education. We need to continue our education and training. We need to have communication to all that are involved. We need to have program visibility.

Did you notice my stickers and my web cards? I'm a scientist, and I enjoy being a marketer as well.

So I would say, don't just publish your work. Make sure that people will use and benefit from your findings. You need to reach your target audience.

So in closing, we must help people understand that what we are doing and our findings are useful, and they need to be interpreted. All of our efforts can be wasted if we don't consider the food handler. And by the food handler, I mean the consumer, the line worker, the food service employee, they need to be in our HACCP center. They need to be in our HACCP system.

Dr. Kennedy spoke yesterday about having a goal, to not be among the safest, but to be the safest. I have no doubt we can, if we have not already accomplished this pre-market. Our

problem occurs at the handling level. People don't make their safe opinion by visiting the farm or the plants which we've been cleaning up. This opinion is made by watching the news. So without education, we cannot achieve and hold onto this goal. Thank you.

DR. KNIPLING: Thank you, Melissa.

Our second speaker scheduled for this afternoon, Mr. Vern Highley, you see on your schedule is not here. He was here earlier in the meeting, but couldn't stay for this afternoon. He was representing the National Watermelon Association. He did leave with me a statement for the record, and we'll make sure that that gets in the record, and you'll have access to it later.

Just to quickly try to capsule his message, I think he was citing some of the voluntary practices the National Watermelon Association Growers are following and also making an appeal for more risk assessment approaches to some of these issues, which we've--which is a recurring theme we've heard throughout this meeting.

Well, we'll move on with the schedule. And our next speaker is Mr. Caesar Compadre, University of Arkansas Medical Sciences Food Safety Group. Caesar?

DR. COMPADRE: Thanks very much for being here. I was just looking anxiously around to see nobody else will leave before I start talking.

The key point that we would like to make in our presentation is that we believe it's imperative to promote and support research to develop safe and effective chemical intervention methods. Methods then can be used at the processing and consumer levels.

This point was stressed this morning by a person in the audience when she asked for the advice of the department in how to sanitize her kitchen. And the best advice that we can give here at this point, or anyone can give here at this point is that she can use a little bleach.

The same thing happened last Friday you were listening to the special program for public radio, I think it was Talk of the Nation, a couple of people, I don't remember where the one was. They gave the same advice to the audience. They advised the people to wash their fresh food and vegetables with bleach, diluted bleach.

When the best answer we can give to the public is to use the little bleach for cleaning their lettuce, then I believe we're in trouble.

With the proper research in this area, we are using--we are condemning ourselves to use outdated and ineffective and unsafe chemicals, such as chlorine, on both the processing and consumer labels.

It is possible to develop safe and effective chemicals to improve food safety. And we would like to illustrate this point with the example of cetylpyridinium chloride then. We say CPC for short for those of you that are afraid of hearing names.

This, this chemical, the research was performed by our group at the University of Arkansas for American Sciences in collaboration with a group at the USDA, a group at Clay Center in Nebraska, Dr. Cutter and Dr. Dorsa, with Dr. Yanbin Li and Dr. Slavik from the Center of Excellence for Food Designs at the University of Arkansas, and with the assistance and the help of Dr. Bill Griffin from the USDA National Agricultural Research Service in Arkansas.

The paradigm then we're proposing, we are using to develop chemicals for intervention in processing and for the consumer label, it starts with the level three evaluation, proceeds with the pilot plan evaluation, and hopefully will reach USDA approval and will be used by the users in a safe and effective way.

When we started with cetylpyridinium chloride, CPC, we screened several chemicals, and we perceived the potential to be used for, and they were safe. And as was pointed yesterday, most of the chemicals, they were not effective. It is very easy to find antimicrobials. It is hard to find antimicrobials and their effect in food service places.

CPC from the very beginning was, was showed very impressive results. It's effective in laboratory conditions. It is the major part to use them. We have been concerned with Salmonella to listeria, including one that is human--it makes its way to the food.

It got more exciting when we found that CPC has been used for over 40 years in over-the-counter products, including mud washes, lozenges, topical preparations. And lozenges are ingested by human populations. Have been used for over 40 years without major, actually with out adverse effects that are known of.

CPCs are also widely used in commercial applications from surface contamination in beta plants, fabric softeners, even in toners for photocopy machines. CPC is non mutagenic, even after cooking. There is no incidence of endocrine or reproductive toxicity. It has very limited transport across biological membranes, which is very important because if it doesn't go through biological membranes, it's less chance then it could become toxic.

It has very low bioaccumulation factors in aquatic organisms. And most important, it's recyclable, recyclable by elements change and other chemical methods, physical methods.

Proceeding from the laboratory into the pilot plan, CPC, when it's compared with other treatments and they're approved or suggested for food for contamination, it was more effective than any of the other chemical treatments available for total microbic counts and was as effective as any other one. It's slightly effective or there's not a significant difference--it's as effective as any other one for Salmonella.

Impressive results from the USDA center in Nebraska in beef treated with feces containing antibiotic resistant Salmonella and E. coli 0157. For 35 days, it was able to maintain the lower level of--this is total microbic counts. This is treated, this is just treated with water and is treated with CPC, big, big reduction in the microbial counts.

Salmonella typhimurium, this is treated with water and this is treated with CPC. Perfectly, no Salmonella up to 35 days of storage at 40 degrees.

Antibiotic resistant pathogenic E. coli 0157, same, same thing.

We don't have yet results from Dr. Cutter. She has been able to observe even up to 50 days it preserves the shelf life of the products.

It's effective in fish, farm codfish. Farm codfish, when you treat it with CPC, this a reduction, because over, over two log reductions at concentration of .51, and over two log reductions when it's a concentration over 2 milligrams per milliliter. And in all of them, APC,

chloroforms, and cyclatroph is the ones that are growing in the refrigerator on the shelf. *Listeria monocytogene* in fish, practically removed.

We feel, this the first time we report these results in apples. This total microbic counts, different cause CPC and they reduce it over two log reduction, from the shelf, from super market. This inoculated *E. coli* 0157, it was able to totally remove the contamination from *E. coli* 0157 from the apples.

The key question, does it have residues? Yes, it does have residues. And we develop-- part of the group was developing analytical method to measure residues. In chickens it's around 17 or 18 parts per million. In fish for experimentation, and most of the--practically 90 percent of the residue is on the skin. Then in the, in the filets, very little, very little residue of CPC.

Cost, compared with other chemicals that have been suggested and approved, like TSP, for example, or chlorine, it's about three times the expense of chlorine, but it's cheaper than TSP or lactic acid.

However, when you see in similar conditions you see the effect, it is more, it is more effective than chlorine. Chlorine is practically ineffective against APC and has one log reduction with *Salmonella*, the concentrations then they're approved.

In summary, we believe the same way that we have developed CPC and we propose it is a valuable addition to the arsenal or methods that are available to the processor or, perhaps, to the consumer. And we hope that eventually we will reach USDA approval.

This chemical is effective, it's stable, water soluble, it's not volatile, it's safe. Very important, it has known acceptable organoleptic properties in terms of flavor, color, or modification of the texture, after these experiments were done, after treating beef steaks with CPC concentration of 10 milligrams per milliliter, it's higher than any of the ones than we're proposing on cooking. And there are no unacceptable organoleptic effects we've observed.

Conducting this research, getting support and we are very grateful for the support of the different organizations, Arkansas Food Science, Food Safety Consortium, supported by USDA and CSREES, and recently used the NRI grant. We are grateful of the support, but it has been hard. It is not easy to get research support to do, to develop chemical treatments.

We propose, and we'd like to go on the record to suggest, we believe it is vital, it is important. It is not the solution. It's no magic bullet. I don't believe it's a magic bullet. Or I don't believe a magic bullet can be available, but it is necessary to keep looking. There's no point to hide and forget about a very, very valuable possibility for combating the food-borne pathogens. Thanks.

[Applause.]

DR. KNIPLING: Well, thank you, Dr. Compadre.

Our next speaker is Paul Dawson from Clemson University, the Food Safety Research Program. Paul?

DR. DAWSON: Thank you. I have one overhead, unlike some of the other speakers. So I should be able to get in, in the 10 minute deadline.

I grew up in Maryland, the Eastern Shore of Maryland, and have lived in the South going to school and now at Clemson for the past 15 years. And I think there is one food quality issue that FDA should look into, and that's how to produce sweetened iced tea north of the Virginia line. You just can't get it. They don't get the solubility thing.

[Laughter.]

DR. DAWSON: I am here representing the Clemson Food Safety Research Program. I kind of am standing in for Dr. Susan Barefoot, some of you probably know, she has recently taken a promotion and now in a position to support this type of work. And I've taken over hers.

As coordinator of this group, I'm not going to go through each of these areas, but this is the group we have currently at Clemson. As you see, it spans--there are five departments in three different colleges and currently 14 faculty and numerous students. And the areas span from microbiology, electromicrobiology, muscle foods, and packaging areas.

In the way of trying to decide on priorities and the areas of research, I think there's one area that's not been mentioned yet. And I'd like to emphasize that as far as universities are concerned, and that is education. I'd be willing to put a big wager on the people who have spoken here, the people in the room raise their hand, they all probably went to the university. And one of the big roles in the university is training and educate--I shouldn't say training--educating people so they can get to a level to make important decisions.

And this includes the graduate research area. And that's a very important area. While we're studying specific areas of research, we are all also, all of us, and I included, came through a program where I learned how to both review the literature and perform research and evaluate other research.

An example of the emphasis needed on education and the public's concern with education recently was illustrated in South Carolina itself in the last gubernatorial election, if any of you kept up with some of the heated elections. And the incumbent was not re-elected--I shouldn't say thrown out of office--but not re-elected pretty much on an educational issue.

So we think that education should be part of the program when we look at some part of the solution, we look at funding for research in food safety.

As far as the research areas specifically of the university, Clemson and all those included, look at mostly basic and longer term research rather than short term research. We try to solve long term problems.

The previous presentation dealt with a potential chemical treatment. It won't be available tomorrow, but we're looking at different solutions. That's an example.

In our area, the one I've been working in, antimicrobial packaging, is an area which would have future applications, but probably not tomorrow.

Along with that, if you look through this list, there's some specific, I guess, less national target areas that this group works on, a few being the rare type. Dr. Mickey Hall is on this list somewhere, yes. And she is working to develop some base line levels for rare type, that's ostrich, emu, those type of emerging food products that there's not a lot of information on, to develop

HACCP programs and that kind of information.

Known is apple cider, and that's probably a national issue, but it's also important in South Carolina. So we have some people working on that as far as E. coli 0157:H7.

And I guess Caroline's gone, but I don't mean to pile on about the consumer education issue from extension, but if you look at Dr. Libby Hoyle, she is involved in educating the food handlers in South Carolina on food safety, and has done quite a, quite a good job of that.

Some general specific points that the group would like to also state or have me state, if you look at the last issue of Food Chemical News, a highly respected microbiologist, food microbiologist, James Jay, made a statement and he's said it over and over again, that we have to be careful when we start applying intervention programs is not to be too specific. That bacteria-- there's a quote that one of my friends told me who is not in this area, but he said, "Bugs are here. Deal with it."

And that's kind of a cruel way to say it, but spoilage organisms of bacteria are there as a safeguard in some instances, and that's Dr. Jay's principle. We certainly need to improve food safety, but at the same time when we do that, we have got to be very careful not to produce or create an atmosphere environment where specific pathogens have an advantage. His illustration was, obviously, Clostridium botulinum or Clostridial spores can survive lab treatments. And if you eliminate all the competitive biota that you will have an environment where they can thrive.

Specifically, one area Michael Davidson brought up, and again our previous speaker illustrated, was chemical treatments. And that's one area that we're working in specifically.

One term I haven't heard mentioned is the hurdle concept. And that area is antimicrobial packaging, both modified atmosphere packaging as well as adding antimicrobial compounds to packaging materials. There are 8.34 million tons of polymer packaging produced a year. And additionally, there's 3 point--about 3 and-a-half million tons of durable goods, that is plastic plates, utensils, those, those things.

So this is the point where a hurdle can be added. That 70 percent of that produced is food contact, or for food packaging. So this is, again as the previous speaker said, not the magic bullet, but another place where we can put in place a hurdle.

We've been working on producing heat extruded protein films, that is not cast films, but these are similar to plastic polymers. And incorporating food grade, the term biocides has been used, which is nisin, and you had a lot of information on that yesterday, but nisin and lisozone, EDTA, lauric acid, and citric acid to these compounds or to these films, and then testing bacteria specific strains as well as total plate counts against their efficacy.

And like was also said, they work great in the lab when you expose these bacteria in either a liquid broth or on a bacterial lawn, they did a great job of inhibiting. The next step is, obviously, to apply it to a food, which is, there is less research on that.

One area we have been looking at, and Michael Davidson, again illustrated, that you need to have contact. One thing I think might be important in that area is fluid foods, like, liquid eggs-- our next speaker will be talking about eggs-- and milk. Fluid foods are in contact with this

surface throughout distribution. And we have shown in inoculated samples with *Listeria* in milk a 5 log reduction in *Listeria* in those samples up to 72 hours of contact or storage.

So there is a potential there in the distribution cycle and through packaging to deliver another, another hurdle to increase both the shelf life and safety of the food.

I guess one of the last things I'd like to say is, again, I think David Schmidt mentioned it, is that we probably need to look at food safety and food quality together, as well as the nutritional effects. I know when we do our work, we also assess these--some other quality factors of the food, not just the specific bacterial. So we look at the quality of the food as well as the safety.

So in summarizing, I would like to see that certainly that all these areas of research and consumer education supported, but I think that we need to not overlook the need for basic research and also the investment in the future of the knowledge base of people who can accurately address these problems well through the universities. Thank you.

[Applause.]

DR. KNIPLING: Thank you, Paul.

Our next speaker is Jill Snowdon from the Egg Nutrition Center. Jill?

DR. SNOWDON: Thank you. I'm going to do something a little different for me today. I'm going to keep it short and simple.

I think that all of the comments that we've heard over the last couple of days have pretty much reflected what--certainly what the egg industry would support. The Egg Nutrition Center is a non-profit branch of the egg industry providing the scientific and technical information on behalf of the industry primarily in the areas of nutrition and now food safety with my position being created and filled in August as the Director of Food Safety Programs.

And so we certainly have support for all of the recommendations that have been coming on down the entire spectrum on food protection. The need for basic research at the farm level, continuing on through distribution and transportation, the challenges that are associated with that, and then also the challenges with making sure that the consumer messages are, indeed, having an effect. And how do you reach out and do the education and what research is needed to support that education?

But the bottom line is disease reduction when we're talking about food safety. And so we believe that the research and regulation should reflect that goal, keeping the eye on that ball. That ultimately what we want to see is an accurate measurement of the disease burden, but then we want to see those numbers drop so that we're preventing disease.

And that risk assessment is only going to be useful as it supports hazard prevention. That ultimately when you take those types of things and use them as tools so that we're stopping the disease transmission, the actual hazard itself.

And things like detection, that should be used to prevent the disease. Again, the same message again and again and again is that we want to prevent the food-borne disease. So that detection techniques aren't used for a primitive control of an industry, but used rather to measure your success or failure and then motivate to change accordingly.

Research can help ensure that the required actions, in this sense it's mostly regulatory actions is what I'm thinking of, and the associated expense that's going to be borne initially by the producer, but then passed on to the consumer, has a benefit. So that as the regulations are required of industry, do we have the data to support that those regulations are going to have a public health impact?

So research, the data should fill that gap to ensure that what's going to be asked of industry then would have the, have a benefit for the effort that's going--and the expense that's going into it. And so certainly standards need to be based on research data. So that's another application for research data and why we support it.

When I asked one of my more senior colleagues what he would contribute to this session today, he said, no problem--he is a veterinarian--he says, no problem, you only need to do two things: find out where the organism is coming from and find out how you can stop it. And that's actually the truth. I would say, again, to keep it simple and to--I think when research priorities are being set, my recommendation would be to focus on simple questions like that. Is this research project, is this course of action, is this policy that is being set, does it support determining where the organism is coming from? Does it support what we can do to stop the organism?

I certainly encourage a broad interpretation of those two things, that the need for detection techniques, for example, are part and parcel for that kind of thing. And the more sophisticated terminology, we would use words like pathogenesis or microbial ecology, which you've seen in all the presentations over the last two days now.

But understanding the course of disease and understanding the factors that might determine growth, survival or transmission, to pull that fundamental information together and then to apply it, certainly to give at least some support to applied research, as well as the basic. So that we can determine the intervention steps that then are going to be effective.

I'll use an example from the egg industry. The current hypothesis is--I was asked at lunch today, would the competitive exclusion product that they spread on broilers, the chicks on the broilers, the chick pecks at it, on its feathers--down I guess it would be called actually--and picks up an inoculation. And in that way then starts up the competitive exclusion process, rather the administration on it. I was asked, is that going to work in the egg industry? I said it's not known, but it may not fit with the current theory on the transmission of the disease. I said, we don't know. I said, we don't know, we do not--currently the hypothesis is that it's a respiratory route of transmission for *Salmonella enteritidis* into a table egg is what I'm talking about now. But we don't know that.

So we don't know if what's food-borne in an oral route of transmission for a human is, indeed, food-borne for the laying chicken, the laying hen. Different, because most of the time we're talking about the elementary tract, but in this instance we're talking about the reproductive tract of the chicken because the *S. enteritidis* is in the oviduct and then secreted in with the white and then the shell is laid around it.

So without that fundamental knowledge of the route of transmission, then we don't even know what the intervention strategies are going to be to effect a change.

But if you can't solve the problem by determining where it comes from and how to stop it, then certainly research is going to be needed to mitigate the problem.

And I've got three categories on that: detection methods, microbial ecology, and human food-borne elements data, again, broad interpretation on these three categories. But certainly we always need the tools to measure and monitor. And the detection methods, microbial detection methods always come up to the top of the list of anybody's research needs.

And along with understanding the ecology of the situation, again an example from the egg industry, the role of rodents moving the *S. enteritidis* into the hen house. What we don't understand is the role of the ecology in the environment outside of the hen house, because that's where the rodents are living. And they just run back and forth between the external area and in. And so a fairly simple biological question of where the reservoir is in the rodents and in the ecosystem, and we do not have a feel for the impact of that on the hens and ultimately on the egg production.

And human food-borne illness data, we need it timely, we need specific, we need accurate, and we also need a correct interpretation on it. So that that kind of thing is a measurement of our success, that we know that the numbers that we have are accurate, and then when the numbers go down, we know, we have confidence then that we have accomplished what we have set out to do.

The egg industry has a number of research activities going. At the farm level there's the biggest focus, and that's on control strategies. There's some work on looking at the water activity in the manure. Certainly the routes of transmission that I talked about earlier. What can be done in terms of farm management practices.

This has been built into a number of quality assurance programs that are in place around the country. Sampling and detection techniques are also very important, because we are not always able to determine, we are not sure that we're picking SE up, even if it might be there. And the prevalence, it's also debatable as to what extent it's--SE is shed so infrequently in the egg, and it's erratic in its appearance in the manure. And we don't have a sense across the country, a very accurate sense across the country of how often, how many birds on how many farms are going to have it at what level, and what does it mean for the human food supply.

So we're doing some work on that and also some work on vaccines. And some of that looks promising on that.

Likewise, research on egg products and egg processing, time and temperature, and activation of SE in the various liquid egg products that are produced. The cooling techniques, we heard an example of that kind of research earlier in the day. Disinfectants also are sometimes included on that.

Research on animal health, a number of diseases and industry supports those. And consumer messages, there is a couple of projects going on in consumer messages, so that the message that comes out indeed changes the behavior.

So I'd wrap up by saying that we need funds for research with direct application to resolving the problem at both basic and applied. And if we did that, then we wouldn't need the funds to mitigate the problem. Thank you.

[Applause.]

DR. KNIPLING: Thank you, Jill.

Our next speaker is Tim Weigner from the Food Marketing Institute. Tim?

MR. WEIGNER: I would like to apologize because I was not here yesterday to have the opportunity to see what was happening. At the same time that this meeting was going on, the Food Safety Training Educational Alliance meeting was occurring in Annapolis, in maybe a little bit better facility than this one. And that alliance includes members from FDA, from the Center of Food Safety, from Office of Regulatory Affairs, from USDA, FSIS, Ag Research, CSREES, school lunch programs from various trade organizations, such as FMI, the National Restaurant Association, representatives from the Association of Food and Drug Officials, IAMFES, NEHA, Ag Extension Specialists, and Consumer Public Voice Interest folks.

And basically our goal was to address what are the training programs and interventions that are actually out there, and how do we get that out to the people that need to look at it. And it seems like the key message that keeps coming up today is the education program.

And one of the things that we're trying to do as an alliance is look at trying to reduce the duplications in the numerous messages ending up at the retail level and making sure that the folks have easy access to that information.

So whatever comes out of this meeting sooner or later has to end up at somebody's hand so it can be applied.

Let me introduce who I am and who I represent. I'm Tim Weigner. I'm the manager for food safety programs for the Food Marketing Institute. We are a non-profit trade organization representing the retail and wholesale food system. We have approximately 1500 members. Fifty percent of them are small independent businesses. The other 50 percent are chain, Kroger as an example, with their 1800 stores, 1800 plus would be one member.

As an organization or association, we do a wide variety of programs. Really the pushing effort is the government relations work, make sure that our members in the retail industry are very well represented on issues like this.

And it's important that we understand this, when we do our research and risk analysis, because as you see when we start presenting data, there's a lot of issues that does come up.

Some facts that I would like to present is, whatever happens, it makes an impact at the retail level. This is just some numbers that we have been able to put together through our local research to the "Trance", and that was mentioned earlier. And "Trance" is an excellent research document to find numbers.

Approximately 170,000 retail food markets out there in the system. And we're starting-- that's just retail food stores. That's not restaurant operations. And we're starting to see more and more restaurant operations end up in the retail stores, and we're starting to see more and more

traditional food processing, such as vacuum packaging, smoking and curing operations ending up at the stores.

But the key thing to remember is through all this, you might have a processor that's dealing with a small commodity group, one particular type of operation, meat market, or a small amount of seafood operations. In a retail store, you turn around and condense this all down, where you have 30,000 different line items.

So the question is, with all the research, what's going to be practical at the retail level?

And this is some of the data that we were able to pull up. This is a report done by progressive grocers back in '92, and it's still pretty well on line as far as the information.

Just in the dairy itself, because dairy is considered potentially hazardous food, really it spoils a lot more than we do have as far as pathogen problems, but it gives you an idea how many items are being handled in the store, where their emphasis is going to be, and how long has that product actually been within the stores.

Eggs, *Salmonella enteritidis* keeps popping upon eggs. But look how long that product is actually on the shelf within the store, 1.56 days.

So if we're looking at intervention projects, you have six different line items coming in with eggs. It's going to be there a day and-a-half, are they going to be able to address it.

Juices and drinks really have hit the market here, especially with the new policies that came out with HACCP interventions for unpasteurized juices. We're starting to see more and more retail stores start doing fresh squeezed juices. And the question is, how long is the product going to be in the store? What are really the significant hazards? And are those supported at the retail level? Deli, bakeries, same basic information, the quick rotation of product within the stores.

But where we really have concerns--and these are things we're going to be working on in the future from FMI is the produce area and the meats, because we know such examples with the sprouts, we do have the *E. coli* issues that we haven't addressed. And we're trying to look into interventions that they can apply at the retail level.

A quick answer would be on some of these things that have been dealing with cut produce is to wash them in a sanitizing solution. Put that in an 18 year old food handler's hands, and have him add additional chemicals to that product, the stores will say you're adding an additional risk to that product. So what is actually practical that is based on good sound science?

Additionally, with meats there was a--we had done a lot of stuff on meats, USDA does have their sampling program for *E. coli* 0157 that's in place. And as of September, this year, at the retail level, USDA has sampled 14,944 samples, a total of six have turned up positive for 0157. That's .04 percent. The question is, what intervention programs do we have in place?

The prime meats listed here are basically fresh meat items. If you look at what's being handled at the retail level, it's coming in as a raw product and being sold as a raw product, and it's going to be on the shelf for not more than 1.07 days, what interventions can we put in program?

Wegman Stores, which is one of our members up in the northeast region, asked this

question a while back. How can they assure their customers that their ground meat products is E. coli 0157 free? They proposed some recommendations that came out with the folks with the FSIS, and basically their final product is they could not assure that. What they ended up doing is putting an additional warning on their product that they sell their consumers telling them this product poses a risk if you consume it raw. The consumers understand that risk.

One of the biggest programs that we are working on, and we're doing it with IDEX Company, is our total food safety program management. And we're--what we did was we brought in our members and we're looking at what are the food safety risks that are applicable at the retail levels and how can we control them.

And we looked at the draft guide lines that FDA has come out with, and we kind of expanded on this. And basically addressed are five key processing areas that we do have concerns and we do have controls. And these are shown up here on the screen.

We brought in our members. We brought in microbiologists. We brought in researchers, and we had them sit down and design flow charts for each one of these products. The members of our stores represented the buyers, the meat market cutters, the produce operators, the actual handlers, and the managers to get a real good idea what is the total thing that's happening in the stores.

Part of this project is going to be taking all the information that we have done in our flow charting and identifying the key processing step and validating that against some good sound science. We have a risk assessment person who is going to go through and look at what we consider critical control points and interventions and determine if the scientific data is out there.

This whole program will really kick off when we put it all together, because it will also include the GMPs that's required, the SSOPs, and additionally training guidelines, what we would like them to have to do at the retail store.

Another project which really is kind of driven by research is a new document we're going to be releasing at the end of this year. And it's kind of put some fears into some folks because it's saying that retail industry might be driving what's going to be happening at the processing level.

And basically the document is the vendor's inquiries. We have put together a draft document. We're going to release it to our members and ask them to go back and look--and have their buyers look at the sources of the products that they're buying. Where is it coming from? If it's fruits and vegetables, what are the land sources it's coming from? What type of watering system do they have in place? What type of laboratory testing programs do they have in place? Are there additional government inspection programs such as for pasteurized milk? Or if the meat is originating from a USDA approved plant, is there intervention programs in place?

We're looking at--we had heard this morning about the use of time/temperature indicators. We're looking at incorporating some current technologies, such as time/temperature indicators, sniffers, data logger, both to monitor the product from a quality aspect and a food safety aspect, and with a little bit of a more finer twist, as a means to trace back the product to the source.

We have been working with a Guatemalan on the raspberry, John Farquhar. And one of

the things that he learned is he can trace back a product once it's received at the final destination by looking at the type of time/temperature indicators that was used. Because he can go back and ask the vendor, which ones were you using, and when did you apply it, and where did you apply that time/temperature indicator.

But the biggest area that we are working on is in partnerships. Because FMI realizes we cannot do this whole food safety program at retail by ourselves. We have done some alliance work with other trade associations. We are networking with the National Restaurant Association. We have been communicating across the board with the National Food Processors Association, because there are some concerns because of the processing steps that are now being incorporated at the retail steps.

And here's some examples of the education programs that we've been talking about. Again, research is going to be driving a lot of this, because it really dictates what our final product is going to be. We do have a manager certification program in place with Cornell University, and we are looking at expanding on that on some of the alliances we've just recently developed.

FMI is a firm member of the Fight BAC program. And I was surprised that the issue of hand washing came up, because this September of this year the theme for Fight BAC was keep it clean, hand washing.

We believe that a lot of the research issues that does come up at the university and industry level, regulatory government level, needs to be communicated through the appropriate channels, especially through the Conference for Food Protection. Because that is the mechanism in place that the states and industry has to make sure that there's good sound information that can be applied at the retail level, that it's incorporated through the Conference for Food Protection, is recognized by FDA or incorporated by FDA, and then it's accepted by the states.

But it actually comes down to this, what are the states mandating at the retail level? If we have state inspection agencies going in there and doing traditional floor, walls, and ceiling inspections, industries are going to react to that, they're going to take care of the floors, walls, and ceilings. But if the emphasis is on food safety, and controlling those things that cause food-borne outbreaks, industry will respond to that correctly.

So what we're looking at is making sure that there is good sound science that's supported and is applicable at the retail level.

Our goal is to have realistic controls and interventions. We can come out and say at a processing level, here's the organism or pathogen we're trying to control, and here is the mechanism that we want to have in place for intervention. But at a retail level where you might have a young person that has very little food safety education background working on a product that will be in the stores one to three days, what intervention mechanism can be in place at that time? Thank you.

[Applause.]

DR. KNIPLING: Thank you, Tim.

Our next scheduled speaker is Tracy Hewitt. Tracy? Tracy's with an organization called

CFARE, the Council of Food, Agricultural, and Resource Economics. Tracy?

MS. HEWITT: Good afternoon. It's a pleasure to be here. I am the Executive Director of the Council on Food, Agricultural, and Research Economics or CFARE as Ed said.

One of our primary goals is to educate policy makers and other scientists about the actual and potential contributions that economics research can make to policy making as it relates to food, agriculture, and natural resources policy.

I am actually wearing two hats this afternoon. First I will read a prepared statement by Dr. Will Rochin. He was appointed by Secretary Glickman to serve on USDA's National Agricultural Research Extension Education and Economic Advisory Board--a mouthful. He apologizes for not being here to attend himself. He is unfortunately away on business in California.

After reading his statement, I have a couple of remarks of my own that I'd like to share with you.

I appreciate the opportunity to make a statement before this group on the role of the social sciences in enhancing our nation's food safety. Biological research to enhance food safety is crucial. However, it can only be efficient and effective when conducted jointly with economics and other social science research.

Economics research, in particular, measures and shapes the impact of the new technologies developed by the biological sciences. I ask that you consider the following discussion of economic and social science research contribution as you generate USDA's list of food safety research priorities.

Economic research is needed to improve our understanding of the benefits and costs of options to reduce food-borne illness from pathogens and pesticide residues in fresh and processed foods. Agricultural economists and other social scientists can assess how changes in consumer demand affect food safety, health, and nutrition.

Through economic research, we can better understand the choices consumers, retailers, and producers make in food production and preparation practices and their responses to food safety information.

Such information could then be used to evaluate the effectiveness of public and private effort to promote safer food production, transportation, handling, and preparation.

The economic incentives for producers to supply safer food should be studied. How economic incentives could be strengthened in both the public and the private program is an important area of research with significant implications for funding long run research to develop new control programs.

Economic research on risk assessment is also critical. Efforts to estimate the benefits and costs of options to reduce food-borne illnesses are hampered by a lack of knowledge about how pathogen control efforts will eventually affect public health.

Further research on risk assessment by economists in collaboration with other scientists will provide decision-makers with better estimates of the benefits and costs of efforts to promote

food safety.

Like several other professional associations, including the animal and plant sciences, the agricultural economists recently generated a list of research priorities. Food safety research was targeted for emphasis by the agricultural economists because they have a lot to offer the science community in this area, from help overcoming economic obstacles, to using incentives to promote practices that enhance food safety, to designing efficient and effective federal regulations or guidelines.

Thank you again for your consideration of these remarks. I urge you to include the potential contributions of economics and other social sciences in your list of national research priorities.

This ends the statement by Dr. Will Rochin of the USDA advisory board.

I'd like to just build upon what Dr. Rochin has laid out here in making his case for economics as part of this national food safety research program by describing some of the important contributions made by the economics profession in this area. And I've brought along a number of props that I'll show to you.

In 1987 to encourage research on the economics of food safety, the USDA supported regional research committee NE 165, created a special project to investigate and stimulate research in this area. The project is called Private Strategies, Public Policies and Food System Performance. It has been exceptionally productive.

For your possible interest and really to demonstrate that economists have been doing research in this area for quite some time, and scientifically rigorous research also, I brought a couple of things to show you. First was a book published in 1991 called The Economics of Food Safety. Here the researchers model consumer behavior. They talk about applying economics to risk assessment methodology. And they analyze firm's response to regulations and voluntary guidelines.

Another book that economists have worked on is Valuing Food Safety in Nutrition. This book, as its title indicates, looks at some of the methodologies that economists use to get at how do society and consumers really value food safety and nutrition concerns. They use examples in here of irradiated meat, as well as bioaccumulation of chemical residues in fish.

Another project, this is an interdisciplinary effort that probably many of you are aware of, tracking food-borne pathogens from farm to table. This is a report published by the Economic Research Service. It was done in collaboration with the Food Safety Inspection Service, APHIS, Farm Foundation, and the American Veterinarian Medical Association. And, again, this is getting at data needs to evaluate control options.

The economists have also led a study here, Strategy and Policy in the Food System, Emerging Issues. One entire section in this report is dedicated to investigating avenues for improving the quality of benefit and cost analysis of food regulation.

In 1995 there was a conference on the economics of reducing health risk from food. In this study, they examined strategies for health risk reduction. They looked at criteria that could

be used to reduce health risk from pathogens. And they looked at the economics at the farm level, at the retail level, and at the processing level to reduce or enhance, rather, food safety.

And finally something that's so new, it's really only available on the web. These are decision-maker summaries from the most recent conference sponsored by the NE 165 regional research committee on the economics of HACCP. This will be available in book form later this year. But in this report, they also talk about designing the most effective and efficient regulations and measuring the benefits and cost of intervention at different points in the production process.

I should, of course, note that these are just a few. This is kind of the tip of the iceberg of economics research in this area. There have been many other important studies by scientists throughout the land grant system and, of course, at the economic research service.

I just have three brief recommendations for those of you who are setting priorities for food safety. First is, be inclusive. The title of this conference was--is A National Conference on Food Safety Research. Yet, not one part of the program was specifically devoted to a discussion of the economics of food safety research or any of the social science issues on food safety research.

Second, encourage interdisciplinary research that crosses not just the subdisciplines of biology, but that also crosses the biological and social sciences.

Third, seek out input from professional associations about their research priorities related to food safety. If you do so, you'll find that not only was food safety identified by the agricultural economists as a research priority, but that the economics of food safety was identified as a research priority by the Coalition for Research on Plant System or Crops 99, as it is more commonly known. And the economics of food safety was recognized in FAIR 95. FAIR 95 is, as many of you know, a consortium of more than 40 organizations representing the food, animal scientists.

I'd like to close by reiterating a point made earlier by Dr. Rochni from USDA's advisory board. There's no doubt in my mind or anyone else's, of course, that the biology of food safety is of utmost importance.

However, a national research program that ignores or overlooks the economic impacts of new technologies, of regulations, or ignores the economic incentives that can modify and/or change behavior of individuals, companies, and institutions, or a research program that ignores how economic tools can enhance and promote food safety, will no doubt shortchange society. Thank you for the opportunity to present these views.

[Applause.]

DR. KNIPLING: Thank you, Tracy. And, Beth, I assume you took note and have a few more covers to add to your list.

We've already heard from Chris Vanderpool earlier this morning in the public comment session before noon. So we'll just move onto David Cradle. Is David here?

I guess not.

Moving on to the 2:45 session that's on the schedule, Craig Harris, as we heard earlier,

could not be here. And we have a substitute in that time slot, Mary Finelli. Mary? Yes.

Mary, if you would identify your organization?

MS. FINELLI: Yes. Hello, my name is Mary Finelli. I'm here on behalf of the Human Society of the United States, which is the largest animal protection organization in the U.S. with over 7 million members and constituents.

I'm very glad to see the attention that is being given to production practices at this conference, and the acknowledgment of the importance to food safety. I'd like to reiterate the need for a national food safety research data base. And I do agree that the National Agricultural Library does seem to be the most sensible choice for this.

Something similar that is happening there, as mandated by Congress in regard to laboratory research, is being performed by the Animal Welfare Information Center which serves as a clearing house for information to prevent duplicative research. Efforts are underway to include a farm animal component to the center.

There is a substantial existing body of research already in existence. And what is needed is a comprehensive literature search and review to determine what is known and how to proceed.

While I am very glad for the attention that is finally being given to the importance of production practices, I'm also concerned by the direction being taken. I'd like to read you a sentence from the President's Council on Food Safety vision statement, which reads, "We work within a seamless food safety system that uses farm to table preventive strategies and integrated research, surveillance, inspection, and enforcement."

However, the approach continues to focus on intervention strategies rather than preventive ones. To paraphrase an old adage, an ounce of prevention is worth a pound of intervention.

Food-borne microbial pathogen problems begin with faulty animal production practices, from breeding animals exclusively for production trades at the expense of their immune competence to intense overcrowding of animals in unsuitable and unhealthful environments to feeding animals inappropriate substances and diets and the excessive use of antibiotics and other drugs to unhygienic and inhumane transport and slaughter. Animal production is rife with problems for animals and ultimately consumers.

It is these three problems that should be the focus of research. Rather than attempting to find some technological fix for practices which are known to exacerbate pathogen problems, such as forced molting whereby hens are starved for up to two weeks and deprived of water for days at a time, a practice which has been shown to exponentially increase bird's susceptibility to Salmonella and its transmission to other birds and eggs, such practices should be banned outright.

Other highly suspect and risky practices, such as the inclusion of downed animals, which are diseased animals, in the food supply should be prohibited until a time, if ever, that they are proven to be safe.

Industry should foot its fair share of the research bill. Phenomenal profits are being made by industry and it should ultimately be their responsibility that the products they sell are safe.

Research into traceback can provide a powerful incentive for industry to clean up its practices.

We also need an animal production food safety regulatory authority. It's unrealistic to expect voluntary compliance of guidelines to suffice. The public health is at stake with as many as 33 million illnesses and 9,000 deaths a year attributed to food safety problems. It is too important to leave up to industry good will. The government should be researching to a much greater extent sustainable systems of safe and humane food production. Thank you.

[Applause.]

DR. KNIPLING: We also have another addition to the schedule, Ken Olson from the American Farm Bureau Federation. Ken?

DR. OLSON: Thank you. Ken Olson, a dairy and animal health specialist in public policy division of the American Farm Bureau Federation.

The American Farm Bureau Federation is the nation's largest general farm organization with about 4.7 million members in 50 states, plus Puerto Rico. Our members produce virtually every commodity that's produced in the United States. And so as you might expect, we need to take really a multi-disciplinary look at what goes on relative to research and food safety.

Farmers and ranchers have several reasons to be concerned about food safety issues. First, they and their families are consumers of the food that they produce. And so they have the same concerns as any other producer--or any other consumer. Also, they have an economic interest in the issue. If their operations are to thrive, it's important that there be increases in consumption. In order to do this, consumers need to be assured of the safety of food both on the domestic and international level.

I found the conference here to be interesting and informative. Many areas have been identified that need additional work. I'm not going to give you a list of the top 10 research priorities today, but rather I'll try and share with you a few ideas of directions that I think need to be going in and things that we need to be looking at.

First, if the priorities are based solely on the presentations that were made at the conference, I think that we're going to be missing some things. It won't be adequate. The presentations tended to be highly focused on microbiological contamination. And while this is an important issue in food safety, it's not the only issue. There are other things that need to be looked at.

A few years ago it seemed that chemical residues were basically the only thing that were considered to be food safety. I think in our organization we tended to look at it that way. As an animal scientist, I knew that this wasn't right, but at the same time that strictly a focus on microbiological contamination is not right. There are other issues that we need to consider as we develop a research agenda.

If we look at chemical residues, that is something I'll talk a little bit more about, because we, as an organization, do have some concerns in this regard. But another area that I don't think has really been addressed at the conference either was zoonotic diseases.

Now, the two most common zoonotic diseases in the U.S., tuberculosis and brucellosis are close to being eradicated from the domestic livestock population. But it's not done yet. We have to finish that job. And that gets into part of food inspection.

If we move to a strictly HACCP system that's more automated, less visual inspection, we lose part of the oversight that's important for monitoring and surveillance. It allows us to complete that eradication. And it's something that's going to need to continue for a while.

We need to know if there is a case of these diseases, if there's a foreign animal disease that arises or an emerging disease. So we need to continue to find ways to watch for these problems and better diagnostics would be a help in this regard.

But there might be other tools that we could look at as well, but I think diagnostics is certainly something that we need to be looking at in that regard.

Turning to the chemical side of the issue. Our organization is quite involved, relative to the Food Quality Protection Act. It's been an issue that has had some concern there.

As I talked to the folks within our organization that work more closely with that, they indicate that since 1988, the number of crop protection tools available to farmers had decreased by about 50 percent. We've gone from 40,000 in 1988 to 20,000 today.

Although the need for conventional pesticides is reduced by the development of some genetically engineered crops, such as corn, soybean, cotton, and others, conventional pesticides are still needed in the production of all conventional crops, including fruits and vegetables.

The bio tech crops, the conventional pesticide alternatives are also essential for resistance management in pest populations.

We've worked hard on integrated pest management programs. But still conventional pesticides are important there. So we need to maintain vigilance in that area.

We're concerned that with the implementation of the Food Quality Protection Act, we have the potential to eliminate the use of entire classes of crop protection aids, particularly the organophosphates and carbamates.

I think as we look at this, it would have drastic effects relative to farm production, also food availability, food quality, and it comes into the food safety area as well. So I think it is something that we do need to certainly be taking a look at.

Another thing on the chemical residue side, we haven't had any discussion here relative to the FARAD program. But I think that this is something that is critical. As we look at drug residues, we need to assure we've got authorization for the FARAD program, but funding continues--but that's something that we certainly need to have as an agenda item. It's not a research item, but it certainly is an information distribution item that's critical to the future of the food production industry.

Now, while I indicated that microbial concerns have been overemphasized in the conference, it still is a critical issue. And I see it as a critical issue. If you look at this, we do need better understanding of the causative agents. Along with this, from a producer standpoint, we need to identify management handling and treatment practices that reduce the levels.

We need to know more about what happens to an animal that leaves the farm. So we look at the transportation system. What are the impacts there? This still is not well defined, and it's an area that's hard to get your hands around, but something that we really need to be looking at.

Others have addressed things from the plant side, so I won't get into that. But certainly it goes all the way through the system. We need to look at pathogens. There's much to be learned yet, and we certainly need to continue to work there.

On the import side, others have addressed this to some extent. But I think, again, there are some concerns that we need to have and perhaps some additional tools that are needed as far as improving our inspection in this area.

Producers want to assure that imported foods meet the same standards as the foods that are produced in the U.S. This is important both from the food safety aspect, from an animal health aspect, and also from the competitive position.

Producers need assurances that the products entering the country are safe for consumption, but also safe in that they don't bring in foreign animal diseases. This does require additional oversight and additional tools would be useful in this regard as well.

So in summarizing, I think, I certainly appreciate the opportunity that we've had to discuss the many aspects going on in food safety. I'd like to endorse again the comments that Beth made relative to the need for a data base of food safety research. I think this is critical as we move forward.

Another thing that had also been alluded to is some of the other work that's gone on in defining priorities. I'm part of the executive planning committee for the FAIR 2002. And USDA is putting significant resources into that. And I certainly hope that we make good use of the outcome from that as far as defining some of the research priorities. But we need to make use of those. But more important than having a book of priorities, we need to make sure that they do get implemented.

The Farm Bureau does look forward to working with the department to see that that's done, and I'm sure that producers are looking forward to the same thing. Thank you.

[Applause.]

DR. KNIPLING: Well, thank you, Ken.

Well, to my knowledge, this completes the list of those speakers that requested an opportunity to make some public comment.

We're well ahead of schedule, and I would ask at this time are there any other individuals or organizations that would like to make any comment for the record?

Well, seeing none or hearing none, let me just move on with a few comments.

I would like to acknowledge Ken's last point. And he alluded to the point that Beth had made earlier about the food safety information officer. Mary Finelli also mentioned that.

From the Agriculture Research Service point of view, we're very conscious of that issue and the farm bill, the Research Title of the Farm Bill that actually required that we also hold this annual food safety conference, also directed the secretary to establish within the National

Agricultural Library, which is now a component of the Agriculture Research Service, a food safety information office. And we do have several representatives of the library here today that have been attending the conference. And they've been especially listening to get a sense of the user community as to what that office should be.

So we're going to be following through with that in some fashion and we'll be hearing more about that in the future.

Well, we are ahead of schedule, but I think we'll just move on to the next item on the agenda. And I'll like to call upon Merle Pierson who has the challenge to summarize the conference and give a few perspectives on the conference.

Summary of Conference

DR. PIERSON: Thank you. And I would like to congratulate this group. You're a hardy group. You're a persistent group. Job well done.

Interesting conference, a lot of questions. Section 615 of the Agricultural Research Extension and Education Reform Act of 1998 states that the secretary shall sponsor a conference to be known as the National Conference on Food Safety Research. It is for the purpose of beginning the task of prioritization of food safety research. The secretary shall sponsor annual work shops in each of the subsequent four years after the conference so that priorities can be updated or adjusted to reflect changing food safety concerns.

So this is an initiation of the intent of Congress. The purpose of this conference, this specific conference, again was to fulfill the intent of Congress by assessing the research needs of a variety of audiences from regulatory agencies, producers, processors, distributors, retail sector and consumers.

Over the past two days you have been provided with an excellent overview of some of the research activities that are going on within the United States. And you've heard many of the needs of our stake holders. And, in fact, through this again the intent of Congress is being fulfilled.

Now, in his opening remarks, Undersecretary Rominger stated that identifying food safety needs from farm to consumption is critical. This conference not only meets the letter of the law to hold a national conference on food safety, but also the spirit of the law.

Mr. Rominger pointed out that the President's Food Safety Initiative pushes our food safety effort to a new level. He further stated that further efforts to better coordinate research at the federal level will come through the newly formed Council on Food Safety. There will also be a Joint Institute for Food Safety Research that will embrace government, academia, and industry in providing the best research on food safety.

These are very unprecedented steps that we've seen taken within the Federal Government. They're broad reaching, broad ranging activities. Certainly we see a tremendous focus now on food safety research and research needs.

If you recall, FDA's listing from several years ago of priorities, it's an interesting priority list and how that had flip flopped over the years. And certainly these priorities will change in the

future. It's not a static situation. It's dynamic.

Eileen Kennedy, Deputy Undersecretary for Research Education and Economics spoke about the Inter- Agency Working Group on food safety research and how this group is looking at what food safety research is being done or sponsored by the Federal Government and defining the food safety research agenda for the future.

And I might say, this is not an easy task. Because what is going on and what's being sponsored is a complex matrix of research activities; very, very impressive research matrix.

For instance, several of us were able to get the ARS publication on research activities in food safety. And that is, it's a nice impressive document. And you take that document with the years of research that have been done, there's a tremendous amount that has been done and is being done, and is being worked on now.

Now, the goal is to give top priority to research directed towards furthering the assurance of public health. Furthermore, the research should address regulatory needs and have an emphasis on prevention. Again, these are comments from Eileen Kennedy.

Now, through stakeholder meetings, the following research needs were identified and listed by Eileen Kennedy. On-farm research, how to decide on research needs that should be addressed, and the additional concept of multi-institutional or multi-disciplinary type of research. We need to do a better job of sharing results. Research on antibiotic resistance. Research related to small producer needs and risk assessment.

Following these introductory presentations, the conference then addressed research needs relative to regulatory and action agencies, research needs for detection, prevention, and risk assessment, for public health and consumers. And we've had several public comments that all plug into this overall activity.

Now what I'd like to do is to give you a few key points related to research needs of regulatory and action agencies and then give you an overview summary of the research needs that were articulated here.

Now, we heard a major concern of the Centers for Disease and Control Prevention to be that there are changes in food-borne pathogens and there are new problems related to food-borne pathogens. CDC sees primary production agriculture as a focal point for research needs. They gave great emphasis for that area. In addition, they felt that there should be further research on antibiotic resistance.

Dr. Woteki, Undersecretary of Food Safety, spoke on research needs for USDA FSIS. And FSIS relies on research done by others to support their goals. They don't conduct research themselves. The driving force for FSIS needs are one, the goal of protecting public health, and two, a farm-to-table strategy.

Now, FSIS has published a research agenda in support of their agency's goals. And this agenda transfers specific needs relative to *E. coli* 0157:H7, *Salmonella*, *Campylobacter jejuni* and *Listeria monocytogenes*, as well as risk assessment.

Now, Dr. Woteki presented a very interesting list of concerns and questions. There were

six of these areas. And I think they're very important considerations in any research agenda.

1. Is the current research agenda being addressed?
2. From the standpoint of farm intervention, has there been practical evaluation of the intervention? Does it work on the farm? Do you go beyond that laboratory?
3. Is the federal investment and research addressing the needs of small producers and processors?
4. Is the current research portfolio balanced as to the pathogens of concern?
5. Does the current research provide the basis for education related to food safety?
6. Is the current balance of intramural and extramural research appropriate?

And finally for regulatory or action agencies, Dr. Stephen Sundlof from FDA Center for Veterinary Medicine discussed FDA's research priorities. And they were:

1. microbiological safety of produce,
2. dairy products and food-borne pathogens.
3. practices related to use of antibiotics and data bases on antimicrobial resistance.
4. research on BSE.
5. additional research on clostridium perfringens.
6. food-borne pathogens associated with aquaculture.

A common thread in all the regulatory research needs was research needed to contribute to the applications of their public health mission and to meet needs relative to risk assessment. There's a common thread that existed between all these.

Most of this conference was focused, though, on reviewing research needs for detection, prevention, risk assessment, public health, and consumers. And then again we had an extensive comment period.

There have been a large number of research initiatives and specific research activities that have occurred over the years to address concerns relative to food-borne pathogens and their control.

I've been in the food safety game for about, well, 25 plus years now. And I've seen activity happen over the years. So food safety research is not a new thing. But what we're seeing is a tremendous focus in that, or a tremendously, let's say, elevated focus in food safety research.

We're entering a new era that gives more emphasis to control of pathogens throughout the entire food system. The system is large. It's complex. It presents many challenges. And these, the system is--what should I say--it's sensitive.

Messing up the system in one part, for example, if we have problems in primary production, that can affect the entire food safety system, in the processing segment, in the retail segment, and even at the consumer level. You can bring to the consumer the safest possible food, but mishandling can result in an outbreak of food-borne illness.

We had a series of excellent presentations related to specific research needs on food safety. Now, I'd like to give you just a brief summary, overview of these. It's a condensation.

What I boil down out of all of this is that there needs to be specific or let's say research

related to sources, distribution and transmission of food-borne pathogens, further research on resistance, growth, and inhibition factors for food-borne pathogens.

There is additional research needed on factors affecting pathogenicity. Research is needed on production, harvesting, processing, distribution, and consumer practices as they affect food-borne pathogens and public health.

There needs to be more and additional research on strategies for pathogen control. More research is needed on identification and detection of pathogens. There is additional concern on antibiotic resistance, and risk assessment needs further attention and support through all these research activities. And economics, practicality and effectiveness in application need to be part of the research agenda.

Comprehensive studies need to be done in all these areas. And it seems to be a rather daunting task. It is well-recognized there is no single solution for the control of the wide range of pathogens that might occur throughout the food system. We don't have that magic bullet.

In depth research across the food system through multi disciplinary, multi institutional efforts on a specific commodity could provide a model for studying other foods. It is clear that multiple tactics will be needed for control of pathogenicity from primary production agriculture through the food system to consumers.

In addition to discussing food-borne pathogens and related research needs, several speakers have expressed needs related to food safety research management, technology transfer, and education. And I would summarize these as:

1. education related to articulation of research results as well as consumer food safety education research.
2. technology transfer for application and food safety management systems, such as HACCP.
3. use of food safety research by regulatory agencies in both promulgating regulations, as well as carrying out the mandate of the regulation.
4. demonstration and evaluation of the efficacy of research results in a practical manner in the food system, the food system of concern.
5. there were several who called for a coordinated national research agenda.
6. more collaborative efforts that transcend many segments of the food system.

It's clear that the scope of research needs, even within a specific commodity is so broad that funding is needed beyond that which is currently available.

Congress has provided a significant increase in funding for food safety research in fiscal year '99. This will provide an important foundation for new research to address the food safety issues discussed at this conference.

In addition, various commodity groups and professional organizations provide considerable financial support for research on food safety, as we heard in some of the presentations.

The Federal Government is now addressing the coordination of research through the Council on Food Safety and the Joint Institute for Food Safety Research. Given the complexity of much of the needed research, it is evident that there is need for a paradigm shift in how we address these needs. Rather than individual research projects, we need to look very seriously at multi institutional, multi disciplinary efforts that are longitudinally integrated throughout the food system. Likewise the paradigm shift should include consideration of funding, not only from the Federal Government in relying just on that as a source, but also the contributions from industry, trade organizations, and other stake holders.

Thus, a research needs agenda should be developed through a cooperative effort with all stake holders. The program over the past two days involved presentations that addressed food safety issues throughout the food system from primary production to consumption. This represents a very important step towards the major cooperative effort that is needed to significantly address the complex food safety issues that are before us.

And I would like to thank you.

[Applause.]

DR. KNIPLING: Well, thank you, Merle, for that outstanding summary.

This concludes our program. And I'd like to take the liberty to make a few concluding remarks.

First of all, let me say on behalf of all of the USDA people involved, we're very, very pleased with the outcome of this conference. I would have to say it exceeded our expectations. We know there have been a lot of food safety meetings, workshops, forums in the past, and there are more to come.

We sometimes feel like we may be wearing out this subject, but it's clear that we have not. There is genuine interest and very sincere contributions. And for that we're very, very appreciative.

We want to thank all of the speakers, not only in this afternoon session, but throughout the entire conference that have really contributed and made it a success.

I want to thank all of the organizers. We had two outstanding co-chairs. We had an excellent committee, but in addition to that committee, a lot of people worked behind the scenes, staff support, recorders, and so forth. And we thank all of those people.

As you know, we are recording all of the proceedings of this. We'll be analyzing this material over the next several months and trying to capsulize the nuggets. Merle, you've made an excellent start on that, and that's going to make that job easier for us. So we appreciate that.

As Merle also pointed out, there will be annual follow-up conferences to this first one. And we'll no doubt review the lessons learned in this conference and be formatting that in an effective way. This turned out, from our perspective, to be an effective forum. But I think we'll certainly want to incorporate some reporting on progress and action taken on some of the priorities that we've heard here today and yesterday.

So I suspect you'll be hearing more about that. I presume that will be sometime next fall,

the next event. But more detail on that will follow.

So without any further comment, we'll declare the conference adjourned.

[Whereupon, at 2:54 p.m., the conference was adjourned.]

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